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RETHINKING AGRICULTURAL COMMUNICATION IN THE CONTEXT OF POWER/KNOWLEDGE: SOCIALIZATION OF DIGITAL AGRICULTURE IN GEYVE

PhD THESIS

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RÉSUMÉ

La communication agricole est un domaine interdisciplinaire à l'intersection de la littérature agricole et de la littérature de communication. La vulgarisation agricole, les systèmes d'information et de connaissances agricoles, l'enseignement agricole, l'alphabétisation agricole, la gestion des risques et des décisions agricoles sont les principaux domaines de la communication agricole. Il s'agit principalement d'un cadre qui englobe la production d'informations et de connaissances agricoles et leur communication entre les parties prenantes concernées. En outre, le paradigme positiviste domine la littérature sur la communication, la vulgarisation, l'information et la connaissance agricoles, qui ont toutes créé des liens étroits les unes avec les autres. La technologie est traitée comme une simple expression de l'instrumentalité, la connaissance scientifique est considérée comme politiquement neutre et la communication est limitée à la compréhension courante de la dichotomie source-récepteur. À cet égard, des études quantitatives sont menées sur le développement de méthodes de communication et de vulgarisation efficaces qui transfèrent les développements technologiques et les informations scientifiques aux agriculteurs de la manière la plus précise possible, en leur permettant d'adopter l'innovation et en créant des réseaux d'information. Ces études utilisent des méthodes de recherche qui reposent sur la collecte de données quantitatives à court terme. En revanche, cette thèse, tout en évitant le déterminisme technologique, examine la construction réciproque de la relation entre la société agricole et la technologie. Elle s'appuie sur le cadre coproductionniste des études sur la science et la technologie, qui examine l'interaction entre les avancées technologiques et le social. Elle explore spécifiquement les références sociales de la technologie et de la connaissance scientifique en utilisant le pouvoir/connaissance de Foucault, qui implique que le pouvoir est construit à travers des formes de connaissance et que la technologie et la connaissance scientifique sont liées à des relations de pouvoir. Dans ce cadre conceptuel, on examine l'affirmation selon laquelle l'agriculture numérique et l'utilisation des big data, qui sont considérées comme l'un des principaux instruments de lutte contre la crise climatique, permettent à la production agricole d'être durable. Dans cette perspective, l'agriculture numérique a été traitée comme un produit historique et social et une analyse généalogique de l'agriculture numérique a été réalisée. Ensuite, une étude de terrain a été menée en choisissant Geyve comme échantillon et les stations climatiques numériques comme technologie. Dans l'étude de terrain, on a d'abord discuté de la manière dont le savoir agricole des luttes de pouvoir/connaissance est socialisé, puis on a discuté de la manière dont l'initiative de "transformation numérique", que l'État tente de diffuser, de la manière dont les messages d'alerte précoce constitués d'informations basées sur des données massives sont intégrés dans les formes de socialisation de la connaissance, de la manière dont ce système d'aide à la décision affecte le pouvoir/connaissance existant et, enfin, dans quelle mesure les stations climatiques numériques garantissent la durabilité de la production agricole. L'étude de la manière dont les connaissances agricoles sont produites, diffusées, utilisées par quels acteurs et comment elles sont socialisées, en bref comment elles sont socialisées, offre une perspective de sciences sociales sur la communication agricole et situe l'enquête sociale critique par rapport

au paradigme positiviste de la littérature. La première et la deuxième sections de l'étude présentent la littérature sur la communication agricole, la vulgarisation, l'information et les systèmes d'information, ainsi que la pertinence de l'agriculture numérique pour ces études. Dans la première partie, la communication agricole est encadrée dans le cadre des systèmes d'information agricole. Dans la deuxième partie, l'émergence, les possibilités techniques, les formes de diffusion et les possibilités des technologies agricoles numériques, qui sont articulées avec les systèmes d'information agricole en tant que systèmes d'aide à la décision.

Dans les troisième, quatrième et cinquième chapitres, l'agriculture numérique est traitée comme un produit historique et social, et le cours historique qui amène l'agriculture numérique et l'utilisation d'informations basées sur les big data en tant que facteur garantissant la durabilité est analysé. Pour ce faire, la méthode de l'histoire du présent de Foucault a été appliquée et l'agriculture numérique a été soumise à une analyse généalogique. La méthode historique du présent, qui se concentre sur les discontinuités, les ruptures et les cassures au lieu d'une compréhension linéaire et progressive de l'histoire, a révélé des transformations significatives dans le triangle de la connaissance agricole, de la technologie et de la société. Elle permet d'évaluer l'expérience historique de la Turquie à travers des périodes spécifiques. Cette périodisation est la suivante : 1923-1949, 1950-1980, 1980-2000 et 2000-jusqu'aujourd'hui. Dans la période 1923-1949 l'enseignement agricole et les connaissances scientifiques étaient diffusés par l'État et l'enseignement dans les instituts et les écoles de village était basé sur le principe de réciprocité entre les connaissances scientifiques et les connaissances paysannes. L'État, qui répondait au besoin d'information des paysans avec les ressources humaines qu'il formait dans le cadre du développement nationaliste, prenait en compte les connaissances traditionnelles et les observations locales des paysans dans la formation pratique. Dans la période 1950-1980, on constate que le modèle américain de développement a été adopté, que l'agriculture intensive basée sur l'efficacité de la production agricole s'est généralisée avec les plans Marshall, que l'appropriationnisme a été accepté comme une connaissance scientifique, que cette connaissance a été diffusée par l'État par l'intermédiaire d'ingénieurs et de techniciens agricoles, et que les médias ont été utilisés à cet égard. On constate que l'appropriationnisme dans la production agricole a sapé le savoir indigène de l'agriculteur et que l'interaction entre 1923 et 1949 s'est transformée en un transfert unilatéral de connaissances au cours de cette période. Les groupes 4-K créés à la place des instituts villageois en sont un exemple. Créés spécialement pour éduquer les enfants ruraux et inspirés par la communauté 4-H aux États-Unis, les 4-K consistent en des activités éducatives dans lesquelles un transfert unilatéral de connaissances est effectué pour moderniser les connaissances agricoles et augmenter la productivité de la production. Entre 1980 et 2000, il y a eu une rupture fondamentale dans les processus de vulgarisation et de communication agricoles. En 1984, la réorganisation du ministère de l'agriculture par le biais de politiques néolibérales a affaibli le rôle protectionniste de l'État dans la réglementation de l'information agricole et a transformé le conseil agricole d'un moteur de l'offre à un moteur de la demande. En particulier avec le projet "Extension agricole et recherche appliquée" mis en œuvre par la Banque mondiale, les agriculteurs ont commencé à être traités comme des individus partageant les coûts. Les services de conseil ont été commercialisés, l'accès à l'information a été individualisé et personnalisé, l'agriculteur a été considéré comme un client et les conseillers comme des prestataires de services. En d'autres termes, la vulgarisation du secteur public était considérablement limitée. Dans la période 2000-aujourd'hui, on constate que les ressources humaines chargées du conseil sont soumises à des cursus qui les détachent des réalités du terrain. Les lycées professionnels agricoles, où l'on formait des techniciens pour répondre aux besoins en personnel intermédiaire de la vulgarisation agricole, ont été transférés du ministère de l'agriculture au ministère de l'éducation nationale, et la formation pratique a été supprimée. On constate que les instituts de recherche TöprakSu, qui produisent les informations utilisées dans le cadre de la vulgarisation agricole publique et mènent des activités de recherche et de développement, sont devenus dysfonctionnels et ont fermé leurs portes. Les bureaux d'études commerciaux ont remplacé l'approche de la vulgarisation publique, qui était éloignée des réalités du terrain et restreinte. Les activités de vulgarisation publique, que l'on a tenté de relancer dans les années 2000 avec les projets "Köy-Mer" et "Tar-Gel", ont été interrompues pour des raisons telles que le fait que les ressources humaines formées étaient éloignées des réalités de l'agriculture et qu'une interaction suffisante avec les agriculteurs n'était pas assurée. Dans ce processus, des mécanismes d'aide à la décision basés sur les big data et des solutions d'agriculture numérique ont commencé à être conçus pour aider les agriculteurs dans leurs processus de prise de décision, et l'information agricole est entrée dans un processus de datafication. Avec les transformations de l'agriculture numérique, les connaissances agricoles ont commencé à être axées sur les big data, et l'utilisation des big data a été attribuée à un développement technologique progressif et à une neutralité scientifique dans le cadre de la rationalité instrumentale. Cependant, bien que cette périodisation montre certaines ruptures, les zones grises entre les deux peuvent être négligées. Afin de saisir ces zones grises, on a examiné la résistance dans les luttes de pouvoir/connaissance, les rencontres entre agriculteurs et ingénieurs, et la manière dont la tension entre le savoir des agriculteurs et le savoir scientifique a été historiquement construite. Des recherches dans les archives et des entretiens ont permis de révéler les tactiques mises en place par les agriculteurs pour contrer l'autorité du savoir scientifique. À ce stade, on découvre que les agriculteurs ont utilisé des tests de fiabilité, que je conceptualise comme le "seuil de fiabilité". Les formes de résistance à l'autorité absolue de la connaissance scientifique sont analysées à l'aide d'un ensemble de concepts empruntés aux Cultural Studies et aux tactiques de De Certeau.

Les sixième et septième chapitres étudient les modes de socialisation de l'agriculture numérique, qui se situe dans le flux historique. Pour ce faire, une étude ethnographique de terrain a été menée en choisissant Geyve comme échantillon et la technologie de l'agriculture numérique comme stations climatiques numériques. Le sixième chapitre présente la conception de la recherche, la méthode, les questions de recherche et les techniques. Dans l'étude de terrain, qui a duré cinq semaines entre le 13.04.2023 et le 20.05.2023, différentes techniques de recherche telles que les entretiens approfondis, l'observation participante, le travail et la discussion, la prise de notes sur l'autoréflexivité ont été utilisées, dans le but de fournir un aperçu approfondi des mécanismes de socialisation des connaissances agricoles. Le septième chapitre présente les résultats de la recherche. Des cartes mentales ont été conçues afin d'organiser les schémas des entretiens. Les mécanismes qui renforcent le pouvoir et les opportunités de résistance dans les luttes pouvoir/connaissance qui émergent dans la socialisation des connaissances agricoles sont discutés séparément dans la plaine et à la montagne. Après avoir révélé le squelette de la socialisation des connaissances agricoles, nous examinons comment l'agriculture numérique est intégrée dans ce squelette et dans quelle mesure elle contribue à la durabilité. Il a été observé que l'agriculture à forte intensité d'intrants et l'appropriation sont dominantes dans la plaine, et que le pouvoir est établi par les mécanismes de la commercialization, de la médicalisation et de la patriarcalisation. Différentes tactiques, y compris des modes d'interaction et d'utilisation de la langue, ont été développées contre le pouvoir de l'appropriationnisme sans former de formes organisées de résistance qui sapent structurellement l'agriculture intensive. La résistance des agriculteurs de la plaine est basée sur les formes quotidiennes de résistance de Scott et sur les tactiques de De Certeau. A la montagne, où l'agriculture de subsistance est dominante, une bataille foucaldienne pour la vérité a lieu entre le savoir indigène des paysans et l'appropriationnisme. Les mécanismes de la bataille pour la vérité sont l'isolement structurel, la commercialization et la préservation du savoir indigène. Les agriculteurs de subsistance tentent de préserver le savoir de la montagne contre l'autorité des prescriptions et l'appropriationnisme. D'autre part, l'éloignement de la jeune génération de l'agriculture provoque des discontinuités dans ce savoir et l'affaiblit en tant que forme de résistance. L'utilisation généralisée de produits agrochimiques dans la production a commencé à promouvoir la compréhension de la production à forte intensité d'intrants. Après avoir identifié le squelette de la socialisation des connaissances agricoles, des conclusions sur la manière dont le big data est intégré dans ces formes de socialisation sont présentées. Les hypothèses épistémologiques et ontologiques de l'agriculture numérique et les hypothèses ontologiques et épistémologiques de la structure agricole sur le terrain ne correspondent pas. Cette non-concordance a conduit à la réorganisation des stations climatiques par des mécanismes qui renforcent le pouvoir de l'agriculture intensive en intrants ; l'agriculture numérique s'est transformée en un facteur qui reproduit les distinctions et les dilemmes existants. L'agriculture numérique a été appropriée par ces mécanismes, et les messages d'alerte précoce, qui devaient permettre aux agriculteurs d'accéder à des informations basées sur des données de grande ampleur, ont perdu leur fonctionnalité. L'agriculture numérique, qui devait renforcer les agriculteurs dans la lutte contre la crise climatique et contribuer de manière significative à la durabilité de la production agricole, a été détournée de ses objectifs.

Dans le huitième chapitre de l'étude, les résultats de l'étude sur le terrain sont discutés avec l'analyse historique et la position du débat au sein de la théorie sociale est tentée avec quelques nouvelles conceptualisations. La première grande conclusion de l'étude de terrain est que les mécanismes de pouvoir/connaissance diffèrent selon le mode de production agricole. Bien qu'ils se manifestent différemment, à travers ces mécanismes, l'information ne s'accumule pas en connaissance et devient discontinue, et la connaissance n'est pas transférée ou est constamment fragmentée. Cela s'est transformé en une crise épistémologique qui réduit l'action des agriculteurs dans les processus de prise de décision et leur enlève leur pouvoir d'interrogation. J'explique cette crise par la conceptualisation de l'"atomisation des connaissances agricoles" dans la plaine et de la "détérioration agricole" dans la montagne. Avec la conceptualisation de l'atomisation des connaissances agricoles", qu'on utilise pour la plaine, on explique la dissociation entre l'expérience et la connaissance, la perte de la mémoire sociale, la "relation sans relation" qui réduit le pouvoir des agriculteurs, et on soutient que la socialisation des connaissances agricoles s'est transformée en un état de non-socialisation. Avec la conceptualisation de la détérioration agricole qu'on utilise pour la montagne, on soutient que la bataille foucaldienne pour la vérité est gagnée par l'appropriationnisme à ce stade de l'histoire, que le savoir local est érodé, que l'agriculteur rural est isolé de l'accès au savoir à la fois par la vulgarisation publique et par les consultants commerciaux, et qu'il est donc sujet à un "isolement structurel". On affirme qu'avec l'éloignement de la génération suivante de l'agriculture, le savoir de la montagne ne peut être transmis, et que le savoir indigène transmis de génération en génération est en train de se dissoudre. Face à cette dissolution, on soutient que les agriculteurs de la montagne se sont transformés en "ange de l'histoire". La deuxième conclusion de la thèse est que la réalité ontologique et épistémologique supposée par l'agriculture numérique et la réalité sociale sur le terrain ne coïncident pas l'une avec l'autre. Afin d'assurer cette coïncidence, les technologies agricoles numériques devraient éliminer les mécanismes qui construisent une structure agricole à forte intensité d'intrants qui vise l'efficacité de la production et la maximisation du profit, et les remplacer par une forme de production agricole dont l'objectif est la récupération écologique. Sinon, elle sera dominée par les mécanismes existants. L'agriculture numérique, qui a été sapée par la production agricole dominante à forte intensité d'intrants à Geyve, a été appropriée par la commercialization, la médicalisation et la patriarcalisation, et a perdu son originalité. Ces mécanismes ont réorganisé les technologies agricoles numériques en leur faveur et se sont adaptés au système agricole intensif en intrants. Dans ce cas, les messages d'alerte précoce envoyés aux agriculteurs par les stations agricoles numériques, qui ont pour objectif de soutenir les agriculteurs dans leurs processus décisionnels, de leur permettre de prendre la bonne décision au bon moment et de réduire le taux de produits chimiques agricoles qu'ils utilisent, n'ont pas atteint leurs objectifs et ont été redérivés par les relations de pouvoir et transformés en simulacre. Mon troisième résultat principal est lié au cadre conceptuel de la thèse. Pour l'établissement mutuel de la technologie et de la société, la société de Geyve doit être renforcée et les agences d'agriculteurs doivent être habilitées. Les agriculteurs qui ont perdu leur autonomie dans les processus de prise de décision, qui ont perdu leur expérience et leur mémoire sociale dans une large mesure, et qui sont limités à des informations unidimensionnelles et à des instructions d'utilisation, montrent que le social est en train de se dissoudre. C'est pourquoi il est nécessaire de défendre la société, comme le dit Foucault, et de faire du "gyrisma social", comme le dit Fakir Baykurt. À la fin de l'étude, des suggestions sur la manière de défendre la société, de réaliser le gyrisma social et de renforcer l'agence des agriculteurs dans les processus de prise de décision sont présentées dans un certain cadre basé sur l'expérience historique de la Turquie.

ABSTRACT

Agricultural communication is an interdisciplinary field at the intersection of agricultural and communication literature. Agricultural extension, agricultural information and knowledge systems, agricultural education, agricultural literacy, agricultural risk and decision management are the main areas of agricultural communication. It is mainly a framework that encompasses the production of agricultural information and knowledge and its communication among relevant stakeholders. Furthermore, the positivist paradigm dominates the literature on agricultural communication, extension, information, and knowledge, all of which have created intimate links with one another. Technology is treated as a mere expression of instrumentality, scientific knowledge is considered politically neutral, and communication is limited to within the mainstream understanding of the source-receiver dichotomy. In this respect, quantitative studies about developing effective communication and extension methods that transfer technological developments and scientific information to farmers in the most accurate way, enabling them to adopt innovation, and creating information networks are carried out. These studies employ research methods that rely on collecting short-term, quantitative data. On the other hand, this study examines the reciprocal establishment of the relationship between agricultural society and technology, while disregarding the premise of technological determinism. The study draws upon the co-productionist framework of Science and Technology Studies, which examines the interplay between technological advancements and the social. It specifically explores the social references of technology and scientific knowledge by employing Foucault's power/knowledge which implies that power is constructed through forms of knowledge and that technology and scientific knowledge are linked to power relations. Within this conceptual framework, this study examines the claim that digital agriculture and big data use, which is regarded as one of the prominent instruments of combating the climate crisis, enable agricultural production to be sustainable. As a requirement of this perspective, digital agriculture has been handled as a historical and social product, and a genealogical analysis of digital agriculture has been made. Then, a field study was conducted by choosing Geyve as a sample and digital climate stations as technology. In the field study, it was firstly discussed through which power/knowledge struggles agricultural knowledge is socialized, then it was discussed in which ways the "digital transformation" initiative, which is tried to be disseminated by the state, in which ways the early warning messages consisting of big data-driven information are integrated into the forms of socialization of knowledge, how this decision support system affects the existing power/knowledge, and finally, to what extent digital climate stations ensure sustainability in agricultural production. Investigating how agricultural knowledge is produced, disseminated, used by which actors and how it is socialized, in short how it is socialized, provides a social scientific perspective on agricultural communication and situates critical social inquiry against the positivist paradigm of the literature. The first and second sections of the study present the literature on agricultural communication, extension, information and information systems and the relevance of digital agriculture to these studies. In the first part, agricultural communication is framed in the focus of agricultural information and

information systems. In the second part, the emergence, technical possibilities, forms of dissemination and possible possibilities of digital agricultural technologies, which are articulated with agricultural information and information systems as decision support systems.

In the third, fourth and fifth chapters, digital agriculture is treated as a historical and social product, and the historical course that brings digital agriculture and the use of big data-driven information as a factor that ensures sustainability is analyzed. For this, Foucault's method of the history of the present was applied and digital agriculture was subjected to a genealogical analysis. The historical method of the present, which focuses on discontinuities, ruptures and breaks instead of a linear and progressive understanding of history, has revealed significant transformations in the triangle of agricultural knowledge, technology and society. It enables to evaluate Turkey's historical experience in this sense through specific periods. This periodization has emerged as 1923-1949, 1950-1980s, 1980s- 2000s and 2000s.- today. In the period between 1923-1949, it was revealed that agricultural education and scientific knowledge was disseminated by the state and that the education in village institutes and schools was based on the principle of reciprocity between scientific knowledge and peasant knowledge. The state, which met the peasants' information need with the human resources it trained within the framework of nationalist development, took into account the traditional knowledge and local observations of the peasants in practical training. In the period between 1950-1980, it is seen that the American model of development was adopted, input intensive agriculture based on efficiency in agricultural production became widespread with the Marshall Plans, appropriationism was accepted as scientific knowledge, this knowledge was disseminated by the state through agricultural engineers and technicians, and mass media was used in this regard. It is seen that appropriationism in agricultural production undermined the indigenous knowledge of the farmer, and the interaction between 1923-1949 turned into a one-sided transfer of knowledge in this period. The 4-K groups opened in place of the village institutes are an example of this. Created especially to educate rural children and inspired by the 4-H community in the USA, 4-K consists of educational activities in which one-sided knowledge transfer is made to modernize agricultural knowledge and increase productivity in production. Between 1980- 2000, there was a fundamental break in agricultural extension and communication processes. In 1984, the reorganization of the Ministry of Agriculture through neoliberal policies weakened the protectionist role of the state in the regulation of agricultural information and transformed agricultural consultancy from a supply driver to a demand driver. Especially with the project "Agricultural Extension and Applied Research" implemented by the World Bank, farmers started to be treated as a cost-sharing individual. Advisory services were commercialized, the access to information was individualized and personalized, the farmer was seen as a customer and the advisors were seen as service providers. In other words, public sector extension was considerably limited. In the 2000-today period, it is observed that the human resources carrying out advisory services were subjected to curriculums that would detach them from the realities of the field. Agricultural vocational high schools, where technicians were trained to meet the need for intermediate staff in agricultural extension, were transferred from the Ministry of Agriculture to the Ministry of National Education, and practical training was eliminated. It is seen that TоprakSu Research Institutes, which produce the information used in public agricultural extension and carry out research and development activities, have become dysfunctional and closed down. Commercial consultancies replaced the public extension approach, which was distanced from the realities of the field and restricted. Public extension activities, which were tried to be revived in the 2000s with the "Köy-Mer" and "Tar-Gel" projects, were terminated due to reasons such as the fact that the human resources trained were far from realities of agriculture and that sufficient interaction with farmers was not ensured. In this process, big data-oriented decision support mechanisms and digital agriculture solutions have started to be designed to help farmers in their decision-making processes, and agricultural information has entered a datafication process. With digital agriculture transformations, agricultural knowledge has started to be made big data-driven, and the use of big data has been attributed a progressive technological development and a neutral scientific within the framework of instrumental rationality. However, although this periodization shows certain breakdowns, the grey areas in between can be overlooked. In order to capture these grey areas, we looked at resistance in power/knowledge struggles, farmer-engineer encounters, and how the tension between farmer knowledge and scientific knowledge was historically constructed. Through archival research as well as interviews, the tactics that farmers developed against the authority of scientific knowledge were revealed. At this point, it is uncovered that farmers employed reliability tests, which I conceptualize as the "reliability threshold". Forms of resistance against the absolute authority of scientific knowledge are analyzed with a set of concepts borrowed from Cultural Studies and the tactics of De Certeau.

The sixth and seventh chapters investigate the ways in which digital agriculture, which is situated within the historical flow, is socialized. For this purpose, an ethnographic field study was conducted by choosing Geyve as the sample and digital agriculture technology as digital climate stations. In the sixth chapter, research design, method, research questions and techniques are given. In the field study, which lasted for five weeks between 13.04.2023-20.05.2023, different research techniques such as in-depth interviews, participant observation, work and talk, taking self-reflexivity notes were used, aiming to provide a deep insight into the socialization mechanisms of agricultural knowledge. The seventh chapter presents the findings of the research. Mind-maps are designed in order to organize the patterns among the interviews in a certain sequence. The mechanisms that reinforce power and resistance opportunities in the power/knowledge struggles that emerge in the socialization of agricultural knowledge are discussed separately in the plain and in the mountain. After the skeleton of the socialization of agricultural knowledge is revealed, it is examined how digital agriculture is integrated into this skeleton and to what extent it contributes to sustainability. It has been observed that input-intensive agriculture and appropriationism are dominant in the lowland, and that power is established through the mechanisms of commercialization, medicalization and patriarchization. Different tactics, including ways of interaction and ways of language use have been developed against the power of appropriationism without forming organized forms of resistance that structurally undermine intensive agriculture. The resistance of the farmers on the lowland is based on Scott's everyday forms of resistance and De Certeau's tactics. On the mountain, where subsistence agriculture is dominant, a Foucauldian battle for truth takes place between the farmers' indigenous knowledge and appropriationism. The mechanisms of the battle for truth are structural isolation, commercialization and preserving indigenous knowledge. Subsistence farmers try to preserve the knowledge of the mountain against the authority of prescriptions and appropriationism. On the other hand, the alienation of the younger generation from agriculture causes discontinuities in this knowledge and weakens it as a form of resistance. The widespread use of agrochemicals in production started to promote the understanding of input-intensive production. After the skeleton of the socialization of agricultural knowledge is identified, findings on how big data is integrated into these forms of socialization are presented. The epistemological and ontological assumptions of digital agriculture and the ontological and epistemological assumptions of the agricultural structure in the field do not match. This failure to overlap has led to the reorganization of climate stations through mechanisms that reinforce the power of input-intensive agriculture; digital agriculture has turned into a factor that reproduces existing distinctions and dilemmas. Digital agriculture has been appropriated by these mechanisms, and early warning messages, which were thought to provide farmers with access to big data-driven information, have lost their functionality. Digital agriculture, which was expected to strengthen farmers in the struggle against the climate crisis and make a meaningful contribution to the sustainability of agricultural production, has detracted from its goals.

In the eighth chapter of the study, the field findings are discussed together with the historical analysis and the position of the debate within social theory is tried to be conveyed with some new conceptualizations. The first main finding of the field study is that power/knowledge mechanisms differ according to the agricultural mode of production. Although they are manifested differently, through these mechanisms, information does not accumulate into knowledge and becomes discontinuous, and knowledge is not transferred or is constantly fragmented. It has turned into an epistemological crisis that reduces the agency of farmers in decision-making processes and takes away their questioning power. I explain this crisis with the conceptualization of "atomization of agricultural knowledge" in the plain and "agricultural deterioration" in the mountain. With the conceptualization of *atomization of agricultural knowledge",* I use for the plain, I explain the dissociation between experience and knowledge, the loss of social memory, the “relation of relationless” that reduces the agency of farmers, and I argue that the socialization of agricultural knowledge has turned into a state of non-socialization. With the conceptualization of *agricultural deterioration,* I use for the mountain, I argue that the Foucauldian battle for truth is being won by appropriationism at this stage of history, that local knowledge is being eroded, that the rural farmer is isolated from access to knowledge by both public extension and commercial consultancies, and therefore subject to "structural isolation". I assert that with the alienation of the next generation from agriculture, the knowledge of the mountain cannot be transmitted, and the indigenous knowledge passed down from generation to generation is dissolving. In the face of this dissolution, I argue that the farmers on the mountain have turned into the "angel of history". The second finding of the thesis is that the ontological and epistemological reality assumed by digital agriculture and the social reality in the field do not coincide with each other. In order to ensure this overlap, digital agricultural technologies should eliminate the mechanisms that build an input-intensive agricultural structure that aims at efficiency in production and profit maximization, and replace them with a form of agricultural production whose focus is ecological recovery. Otherwise, it will be dominated by existing mechanisms. Digital agriculture, which has been undermined by the dominant input-intensive agricultural production in Geyve, has been appropriated by commercialization, medicalization and patriarchization, and has lost its originality. These mechanisms have reorganized the emptied digital agricultural technologies in their own favour and adapted to the input-intensive agricultural system. In this case, the early warning messages sent to farmers from digital agricultural stations, which have goals such as supporting farmers in their decision-making processes, enabling them to make the right decision at the right time, and reducing the rate of agricultural chemicals they use, have failed to achieve their goals, and have been re-derived by power relations and turned into simulacra. My third main finding is related to the conceptual framework of the thesis. For the mutual establishment of technology and society, the social in Geyve needs to be strengthened and farmers' agencies need to be empowered. Farmers who have lost their autonomy in decision-making processes to a great extent, who have lost experience and social memory to a large degree, and who are limited to one-dimensional information and instructions for use, point to the dissolution of the social. For this reason, it is necessary to defend society as Foucault says, and to do "social gyrisma" as Fakir Baykurt says. At the end of the study, suggestions on how to defend society, how to carry out social gyrisma and how to strengthen the farmers' agency in decision-making processes are presented in a certain framework based on Turkey's historical experience.

ÖZET

Tarımsal iletişim, tarım ve iletişim literatürünün kesişiminde yer alan disiplinler arası bir alandır. Tarımsal yayım, tarımsal bilgi ve bilgi sistemleri, tarımsal eğitim, tarımsal okuryazarlık, tarımsal risk ve karar yönetimi tarımsal iletişimin temel alanlarıdır. Temel olarak, tarımsal enformasyon ve bilgi üretimi ile bunların ilgili paydaşlar arasında iletişimini kapsayan bir çerçevedir. Bununla birlikte birbiriyle oldukça yakın temaslar kuran tarımsal iletişim, yayım, enformasyon ve bilgi literatüründe pozitivist paradigma hakimdir ve nicel çalışmalar yürütülmektedir. Teknoloji salt bir araçsallığın ifadesi olarak ele alınırken, bilimsel bilgi politik açıdan tarafsız kabul edilmekte, iletişim kaynak-alıcı ikiliği sınırlılığında anaakım anlayışın içine hapsedilmektedir. Teknolojik gelişmeleri ve bilimsel bilgileri çiftçilere en doğru şekilde aktaran, onların yeniliği benimsemesini sağlayan etkili iletişim ve yayım yöntemleri geliştirilmesi, bilgi ağlarının oluşturulması çalışmaların ana eksenini oluşturmakta, bu çalışmalarda kısa süreli, nicel veri toplamaya dayalı araştırma teknikleri kullanılmaktadır. Bu çalışma ise teknolojik determinizmden sıyrılarak tarım toplumu ve teknoloji arasındaki ilişkinin karşılıklı olarak nasıl kurulduğuna bakmaktadır. Bilim ve Toplum Çalışmaları'nın ortak inşacı teorik çerçevesine yaslanan çalışma, Foucault'nun bilgi/iktidar kavramsallaştırmasını baz alarak teknolojinin ve bilimsel bilginin toplumsal referanslarına başvurmaktadır. Bilimsel bilginin çeşitli güç mücadeleleri doğurduğunu, teknolojik gelişmelerin bu mücadelelerle birlikte evrildiğini tartışmaktadır. İklim kriziyle mücadele öne çıkan araçlarından biri olarak görülen dijital tarımın başka bir deyişle büyük veri güdümlü bilginin tarımsal üretimi sürdürülebilir kılacağına dair iddiayı da bu kavramsal çerçevede sınamaktadır. Bu perspektifin bir gereği olarak dijital tarım tarihsel, toplumsal bir ürün olarak ele alınmış, dijital tarımın soykütüksel bir çözümlemesi yapılmıştır. Ardından örneklem olarak Geyve ve teknoloji olarak dijital tarım istasyonları seçilerek bir saha çalışması yapılmıştır. Saha çalışmasında öncelikle tarımsal bilginin hangi bilgi/iktidar mücadeleleriyle aracılığıyla toplumsallaştığı tartışılmış, ardından devlet eliyle yaygınlaştırılmaya çalışılan "dijital dönüşüm" hamlesinin, büyük veri güdümlü bilgiden oluşan erken uyarı mesajlarının bilginin toplumsallaşma biçimlerine hangi şekillerde eklemlendiği, bu karar destek sisteminin mevcut bilgi/iktidar mücadelesini nasıl etkilediği son kertede dijital iklim istasyonlarının tarımsal üretimdeki sürdürülebilirliği hangi ölçüde sağladığı tartışılmıştır. Tarımsal bilginin nasıl üretildiği, dolaşıma sokulduğu, hangi aktörler tarafından nasıl kullanıldığı kısacası nasıl toplumsallaştığını araştırmak tarımsal iletişime sosyalbilimsel bir perspektiften bakmayı sağlamakta, literatürdeki pozitivist paradigmanın karşısında eleştirel sosyal düşünceyi yerleştirmektedir. Çalışmanın birinci ve ikinci bölümleri tarımsal iletişim, yayım, enformasyon ve bilgi sistemleri literatürünü aktarmakta, dijital tarımın bu çalışmalarla ilişkisini ortaya koymaktadır. Birinci bölümde tarımsal iletişim tarımsal bilgi ve enformasyon sistemleri odağında çerçevelenmektedir. İkinci bölümde ise karar destek sistemleri olarak tarımsal bilgi ve enformasyon sistemlerine eklemlenen dijital tarım teknolojilerinin ortaya çıkışını, teknik imkanlarını, yaygınlaştırılma biçimlerini, olası imkânlarını aktarmaktadır.

Üçüncü, dördüncü ve beşinci bölümde dijital tarım tarihsel ve toplumsal bir ürün olarak ele alınmış, dijital tarımı ve büyük veri güdümlü bilginin kullanımını sürdürülebilirliği sağlayan bir faktör ortaya çıkaran tarihsel akış incelenmiştir. Bunun için Foucault'nun şimdinin tarihi yöntemi uygulanmış, dijital tarım soykütüksel bir çözümlemeye tabii tutulmuştur. Lineer ve ilerlemeci tarih anlayışı yerine süreksizliklere, kopukluklukluklara, kırılımlara odaklanan şimdinin tarihi yöntemi tarımsal bilgi, teknoloji ve toplum üçgenindeki belirgin dönüşümleri ortaya çıkarmış, Türkiye'nin bu anlamdaki tarihsel tecrübesini belirli dönemle aracılığıyla aktarabilmeyi sağlamıştır. Söz konusu dönemselleştirme 1923-1949, 1950-1980'ler, 1980'ler-2000'ler ve 2000'ler-bugün olarak ortaya çıkmıştır. 1923-1949 arası dönemde tarımsal bilginin devlet eliyle yaygınlaştırıldığı, köy enstitülerinde ve okullarındaki eğitimin bilimsel bilgi ve köylü bilgisi arasında karşılıklılık esasına dayandığını ortaya konmuştur. Ulusalcı kalkınma çerçevesinde yetiştirdiği insan kaynaklarıyla köylülerin bilgi ihtiyacını karşılayan devlet, uygulamalı eğitimlerde köylülerin geleneksel bilgilerini, yerel gözlemlerini dikkate alacak bir anlayışla hareket etmiştir. 1950-1980'ler arası dönemde Amerikan kalkınmacılık anlayışına geçildiğini, tarımsal üretimde verimliliği esas alan girdi yoğun tarımın Marshall planlarıyla birlikte yaygınlaştığı, temellükçülük odaklı bilimsel bilgi olarak kabul edildiği, bu bilginin devlet eliyle ziraat mühendisleri ve teknisyenler aracılığıyla yayımının yapıldığını, bu hususta kitle iletişim araçlarının kullanıldığı görülmektedir. Tarımsal üretimdeki temellükçülüğün çiftçinin yerel bilgisinin altını oyduğu, 1923-1949 arasındaki etkileşimin, bu dönemde tek taraflı bilgi aktarımına döndüğü görülmektedir. Köy enstitülerinin yerine açılan 4-K grupları bunun bir örneğidir. Özellikle kırsaldaki çocukları yetiştirmek adına oluşturulan ve Amerika'da 4-H topluluğundan esinlenerek oluşturulan 4-K, tarımsal bilgiyi modernleştirmek, üretimde verimliliği artırmak üzerine tek taraflı bilgi aktarımının yapıldığı eğitim faaliyetlerinden oluşmaktadır. 1980-2000'ler arası tarımsal yayım ve iletişim süreçlerinde çok temel bir kırılımlar yaşanmıştır. 1984 yılında Tarım Bakanlığı'nın neoliberal politikalar aracılığıyla yeniden organizasyonu, devletin tarımsal bilginin düzenlenişindeki korumacı rolünü zayıflatmış, tarımsal danışmanlığı arz güdümlüden talep güdümlüye dönüştürmüştür. Özellikle Dünya Bankası tarafından uygulanan "Tarımsal Yayım ve Uygulamalı Araştırma" adlı proje ile çiftçi bilgiye erişmede maliyet paylaşan bir birey olarak görülmüştür. Danışmanlıklar ticarileşmiş, bilgiye erişim bireyselleşmiş, çiftçi bir müşteri, danışmanlar ise hizmet sağlayıcı olarak görülmüştür. Başka bir deyişle, kamucu yayım oldukça sınırlanmıştır. 2000'ler -bugün döneminde ise danışmanlıkları yürüten insan kaynağının sahanın gerçekliklerinden kopacak müfredatlara tabii kılındığını, tarımsal yayımdaki ara eleman ihtiyacını karşılan teknisyenlerin yetiştirildiği zirai meslek liselerinin Tarım Bakanlığı'ndan Milli Eğitim Bakanlığı'na bağlanmasıyla birlikte uygulamalı eğitimlerin kaldırıldığı görülmektedir. Kamucu tarımsal yayımda kullanılan bilgiyi ortaya çıkaran ve araştırma geliştirme faaliyetlerini yürüten ToprakSu araştırma enstitülerinin işlevsizleştiği ve kapatıldığı görülmektedir. Sahanın gerçekliklerinden uzaklaştırılan ve sınırlandıran kamucu yayım anlayışının yerine ticari danışmanlıklar geçmiştir. 2000'li yıllarda "Köy-Mer" ve "Tar-Gel" projeleriyle canlandırılmaya çalışan kamucu yayım faaliyetleri, yetiştirilen insan kaynağının tarımsal gerçekliklerden uzak oluşu, çiftçilerle yeterli etkileşminin sağlananaması gibi sebeplerle sonlanmıştır. Bu süreçte ayrıca çiftçilere karar verme süreçlerinde yardımcı olması için büyük veri odaklı karar destek mekanizmaları, dijital tarım çözümleri tasarlanmaya başlanmış, tarımsal bilgi bir dataficaition sürecine girmiştir. Dijital tarım dönüşümleriyle tarımsal bilgi büyük veri güdümlü kılınmaya başlanmış, büyük veri kullanımına araçsal mantık çerçevesinde ilerlemeci bir teknolojik gelişme, nötr bir bilimsellik atfedilmiştir. Söz konusu dönemselleştirmeler belirli kırılımları gösterse de aradaki gri alanlar kaybolabilmektedir. Bu gri alanları yakalamak adına bilgi/iktidar mücadelesindeki direnişlere, çiftçi-mühendis karşılaşmalarına, çiftçi bilgisi-bilimsel bilgi arasındaki gerilimin nasıl kurulduğuna bakılmıştır. Arşiv taramasının yanı sıra sözlü tanıklıklar aracılığıyla çiftçilerin bilimsel bilginin otoritesine karşı geliştirdikleri taktikler ortaya atılmıştır. Bu noktada çiftçilerin "güvenilirlik eşiği" olarak kavramsallaştırdığım güvenirlik testlerine başvurdukları ortaya çıkmıştır. Bilimsel bilginin mutlak otoritesine karşı kurulan direniş biçimleri Kültürel Çalışmalar alanından ödünç alınan kavram setleriyle, De Certeau'nun taktikleriyle incelemiştir.

Altıncı ve yedinci bölüm ise tarihsel akış içerisine yerleştirilen dijital tarımın hangi biçimlerde toplumsallaştığını araştırmaktadır. Bu amaç doğrultusunda örneklemi Geyve, dijital tarım teknoloji ise dijital iklim istasyonları olarak seçilerek etnografik bir saha çalışması yapılmıştır. Altıncı bölümde araştırma tasarımına, yöntemine, araştırma sorularına, tekniklerine yer verilmiştir. 13.04.2023-20.05.2023 tarihleri arasında beş hafta süren saha çalışmasında, derinlemesine görüşme, katılımcı gözlem, yürüme ve konuşma, özdüşünümsel notlar almak olmak üzere farklı araştırma teknikleri kullanılmış, tarımsal bilginin toplumsallaşma mekanizmalarına ilişkin derin bir içgörü sunulmaya çalışılmıştır. Yedinci bölümde ise araştırmanın bulguları yer almaktadır. Görüşmeler arasındaki örüntüleri belirli dizgeselliğe sokmak adına zihin haritaları tasarlanmıştır. Tarımsal bilginin toplumsallaşmasında ortaya çıkan bilgi/iktidar mücadelelerinde iktidarı pekiştiren, direniş imkanları açan mekanizmalar ovada ve dağda farklı şekilde ele alınmıştır. Tarımsal bilginin toplumsallaşma iskeleti ortaya konduktan sonra dijital tarımın bu iskelete nasıl eklemlendiği, sürdürülebilirliğe hangi ölçüde katkı sağladığı tartışılmıştır. Ovada girdi yoğun tarımın ve temellükçülüğün baskın olduğu, bu iktidarın ticarileşme, tıbbileşme ve patriyarkikleşme mekanizmalarıyla kurulduğu görülmüştür. Bu iktidarın düzenlenişine karşı etkileşim biçimleri ile dil kullanım biçimleri olmak üzere farklı taktikler geliştirilmiş, girdi yoğun tarımı yapısal olarak sarsan örgütlü direniş hatları kurulamamıştır. Ovadaki çiftçilerin direniş Scott'un gündelik direnişlerinden ve De Certeau'nun taktiklerden oluşmaktadır. Geçimlik tarımın hakim olduğu dağda ise çiftçilerin yerel bilgisi ile temellekçülük arasında bir doğruluk savaşı yaşanmaktadır. Doğruluk savaşının mekanizmaları yapısal izolasyon, ticarileşme ve yerel bilgiyi koruma olarak ortaya çıkmıştır. Geçimlik üretim yapan çiftçiler, reçetelerin ve temellükçülüğün otoritesine karşı dağın bilgisini korumaya çalışmaktadır. Öte yandan, genç neslin tarıma yabancılaşması yerel bilgide süreksizliklere yol açmakta ve onu bir direniş biçimi olarak zayıflatmaktadır. Üretimde tarımsal kimyasalların yaygın kullanımı ise girdi yoğun üretim anlayışını teşvik etmektedir. Nihayetinde tarımsal bilginin toplumsallaşma mekanizmalarında ortaya çıkan bilgi/iktidar mücadelelerinin tarımsal üretim biçimine göre değiştiği görülmüştür. Tarımsal bilgininin toplumsallaşma iskeleti çıktıktan sonra büyük verinin bu toplumsallaşma biçimlerine nasıl entegre edildiğine ilişkin bulgulara yer verilmiştir. Dijital tarımın epistemolojik ve ontolojik varsayımları ile sahadaki tarımsal yapının ontolojik ve epistemolojik varsayımları birbiriyle örtüşmemektedir. Bu örtüşmeme hali iklim istasyonların, girdi yoğun tarımın iktidarını pekiştiren mekanizmalar aracılığıyla yeniden düzenlenişini getirmiş; dijital tarım mevcut ayrımlarını ve açmazlarını yeniden üreten bir unsura dönüşmüştür. Dijital tarım bu mekanizmalar tarafından temellük edilmiş, çiftçilerin büyük veri güdümlü bilgiye erişimini sağlayacağı düşünülen erken uyarı mesajları işlevselliğini kaybetmiştir. İklim kriziyle mücadele çiftçi güçlendireceği, tarımsal üretimdeki sürdürülebilirliğe anlamlı bir katkı sağlayacağı düşünülen dijital tarım hedeflerinden uzaklaşmıştır.

Çalışmanın sekizinci bölümde saha bulguları tarihsel çözümleme ile birlikte ele alınmış, tartışmanın sosyal teori içerisindeki pozisyonu birtakım yeni kavramsallaştırmalarla aktarılmaya çalışılmıştır. Sahanın ilk temel bulgusu bilgi/iktidar mekanizmalarının tarımsal üretim biçimine göre farklılaştığıdır. Her ne kadar farklı şekilde açığa çıksalar da söz konusu mekanizmalar aracılığıyla enformasyonun birikerek bilgiye dönüşmemekte, süreksizleşmekte; bilginin ise aktarılamamakta ya da sürekli olarak parçalanmaktadır. Çiftçilerin karar verme süreçlerinde eyleyiciliklerini azaltan, sorgulayıcı güçlerini elinden alan bir epistemolojik krize dönüşmüştür. Bu krizi ovada "tarımsal bilginin atomikleşmesi" kavramsallaştırmasıyla açıklarken dağda "tarımsal bozulma" ile açıklıyorum. Ova için kullandığım *tarımsal bilginin atomikleşmesi* kavramsallaştırmasıyla deneyim ve bilgi arasındaki ayrışmayı, toplumsal hafıza yitimini, çiftçilerin eyleyiciliklerini azaltan relation of relationlessleri açıklıyor, tarımsal bilginin toplumsallaşmasının bir toplumsallaşamama haline döndüğünü iddia ediyorum. Dağ için kullandığım *tarımsal bozulma* kavramsallaştırmasıyla Foucault'cu doğruluk savaşının tarihin bu aşamasında temellükçülük tarafından kazanılmakta olduğunu, yerel bilginin erozyona uğramaya başladığını, kırsaldaki çiftçinin bilgiye erişim hususunda hem kamucu yayımın hem ticari danışmanlıklar tarafından izole edildiğini bu nedenle "yapısal izolasyona tabii tutulduğunu iddia ediyorum. Bir sonraki neslin tarımdan yabancılaşmasıyla dağın bilgisinin aktarılamayacağını, nesilden nesile aktarılan yerel bilginin erimekte olduğunu ortaya koyuyor, bu çözülme karşısında dağdaki çiftçilerin Benjamin'in işaret ettiği "tarihin meleğine" dönüştüğünü tartışıyorum. Tezin ikinci bulgusu dijital tarımın varsaydığı ontolojik ve epistemolojik gerçeklikle, sahadaki toplumsal gerçekliğin birbiriyle örtüşmediğidir. Bu örtüşmenin sağlanması için dijital tarım teknolojileri odağına üretimde verimliliği, kâr maksimizasyonunu hedef alan girdi yoğun tarımsal yapıyı inşa eden mekanizmaları ortadan kaldırıp yerine odak noktası ekolojik kazanım olan tarımsal üretim biçimini yerleştirmelidir. Aksi takdirde mevcut mekanizmalar tarafından ele geçirilecektir. Geyve'de baskın olan girdi yoğun tarımsal üretim tarafından içi boşaltılan dijital tarım, ticarileşme, tıbbileşme ve patriyarkikleşme tarafından temellük edilmiş, orjinalliğini yitirmiştir. Söz konusu mekanizmalar içi boşaltılan dijital tarım teknolojilerini kendi lehine olacak şekilde yeniden düzenlemi, türetmiş girdi yoğun tarım sistemine uyumlandırmıştır. Şu halde çiftçileri karar verme süreçlerinde destekleyici olma, doğru zamanda doğru karar vermelerini sağlama, kullandıkları tarımsal kimyasal oranlarını düşürme gibi hedefleri olan dijital tarım istasyonlarından çiftçilere gönderilen erken uyarı mesajları hedeflerini gerçekleştirememiş, iktidar ilişkileri tarafından yeniden türetilerek bir simulakra dönüşmüştür. Üçüncü temel bulgum ise tezin kavramsal çerçevesine ilişkindir. Teknolojinin ve toplumun karşılıklı olarak kurulması için Geyve'de toplumsal olanın güçlendirilmesi gerekmekte, çiftçilerin eyleyiciliklerinin güçlendirilmesi gerekmektedir. Karar verme süreçlerinde otonomilerini büyük ölçüde kaybeden, deneyimi ve toplumsal hafızayı büyük ölçüde yitiren, tek boyutlu bilgilerle kullanım talimatlarıyla sınırlandırılan çiftçiler toplumsal olanın çözüldüğüne işaret etmektedir. Bu nedenle Foucault'nun dediği gibi toplumu savunmak, Fakir Baykurt'un dediği gibi "toplumsal kirizma" yapmak gerekir. Çalışmanın sonunda toplumun nasıl savunulacağına, toplumsal kirizmanın nasıl yapılacağına, çiftçinin karar verme süreçlerinde eyleyiciliğinin nasıl güçlendireceğine dair öneriler ise Türkiye'nin tarihsel tecrübesine dayanarak belirli bir çerçeve içerisinde sıralanmıştır.

INTRODUCTION

An Overview of The Study: Rethinking Agricultural Communication from the Perspective of Critical Theory

Agricultural communication is defined as an interdisciplinary social science field that focuses on the communication process in the process of transferring information on issues such as agriculture, animal husbandry, food, nutrition, environment, climate crisis to relevant stakeholders (Zumalt, 2007). Born in the early 19th century in the USA, this research field emerged within the framework of delivering and disseminating agricultural information to rural areas (Tucker et.al. 2003). As a result of the developments in information and communication technologies, today there are studies carried out for the purposes of agricultural communication, conveying agricultural information to the target audience through various communication tools, effectively transferring scientific knowledge and technological developments to the relevant communities, designing effective communication systems that enable information exchange, and communicating with agricultural audiences (Zumalt, 2007; Sing et.al. 2013). It is noticeable that these studies remain within the mainstream approach of communication studies and are limited to the period of empirical studies dominated by behaviourist tendency. It is possible to argue that the positivist paradigm dominates the agricultural communication literature, with the models in the mainstream approach predicting that the message with predetermined meaning sent by the source is delivered to the receiver through effective communication channels. For example, Telg and Irani (2012) and Budak (2020) state that one of the most widely used models in agricultural communication is Shannon and Weaver's communication model. Later addition of a feedback mechanism to this model shows that communication in agricultural communication is constructed as one-way. Federer (2015) defines agricultural communication as the dissemination of agricultural messages to the audience through many forms of communication and communicating with stakeholders. It can also be considered as the exchange of particular information about agricultural issues, informing communities and masses about agricultural issues (Agunda, 1989), designing and distributing news about agriculture (Tucker et.al. 2003). Budak (2020) emphasizes that agricultural communication is emerging as a new academic discipline in Turkey. Budak, who claims to conduct the first academic study on agricultural communication with her PhD thesis, defines agricultural communication in terms of message transfer between the source and the receiver. When "agricultural communication" is searched as a keyword, Budak's thesis appears as the first study in the field. However, it can be said that agricultural communication is positioned under agricultural extension activities that started in the 19th century. Although agricultural extension stands out with its educational aspect, it is a field intertwined with agricultural communication in which engineers convey scientific information and technological developments to farmers, guide decision-making, and use various communication techniques for farmers to adopt innovations. This is evident from the titles of "agricultural extension and communication" and "agricultural extension and communication" courses in agricultural engineering education. The positivist paradigm is also dominant in agricultural extension studies. Empirical studies that enable farmers to adopt technological innovations and scientific knowledge in order to increase agricultural productivity and develop educational, persuasive and motivational communication techniques to ensure behavioural change are dominant. The industrialization of agriculture and the focus on high yields have reinforced a hierarchical, one-dimensional communication structure that absolutizes the authority of scientific knowledge and technology, where information is transferred from the agricultural engineer to the farmer. However, with the participatory approach that emerged in the 1980s, it is seen that the farmer is put at the center in studies such as agricultural extension and communication, agricultural information and information systems. The top-down unidirectional transfer of information and technology has been replaced by an understanding in which relationships are reorganized horizontally and the farmer is repositioned as not only a passive receiver but also an active sender. However, it is seen that the quantitative paradigm, progressive rationality and technological determinism are still dominant in agricultural extension activities carried out under the participatory approach. It is seen that studies such as analyzing the information networks between actors according to the intensity of interaction, measuring the opinions of farmers about extension staff, and monitoring the results of extension activities in production are carried out through short-term surveys and questionnaires. The ultimate aim is to transfer scientific and technological developments to farmers through various communication tools and methods and to improve their knowledge and skills in this regard. Obviously, intertwined agricultural extension, agricultural communication, agricultural information and knowledge studies have been limited within the positivist rationality that attributes absolute rationality and objectivity to science. It has not been addressed through critical thinking that treats communication as an economic, political, social and historical product. It is revealed that critical thinking and qualitative paradigm that is emerged as a result of several turns in social theory as such critical turn, cultural turn, interpretative turn is not introduced into agricultural communication studies.

Critical science, technology and society studies (STS), which emerged in the 1970s as a reflection of the critical thinking that became widespread in social sciences, discusses the connection of instrumental rationality with power relations, ideologies that transform scientific knowledge into myths, and the ways in which technology is experienced by society. There are no studies in the agricultural extension and information literature that have been conducted from an STS perspective. In this thesis, I consider agricultural knowledge not as a neutral entity transmitted through the absolute rationality of instrumental rationality, but as a historical product that is socialized through actor relations. Building on Foucault's critical social inquiry, I argue that agricultural knowledge is socialized through a set of power/knowledge mechanisms. In this way, I attempt to *socialscientification* of intertwined literature on agricultural extension, agricultural communication, agricultural information and information systems. In line with the possibilities provided by the qualitative paradigm and ethnographic methods, I attempt to reveal particular patterns and deep insights into the complex relationship between agricultural knowledge, technology and society. With this perspective, I try to understand how digital agricultural technologies, which are claimed to strengthen sustainable agriculture today, are experienced, how they are socialized, with which networks and how big data are communicated, and to what extent they can ultimately ensure sustainability in production.

Objectives and Methodology of the Study

After the literature review on agricultural communication, extension, information and knowledge systems, which are in close contact with each other, the scope of the study became clear to a great extent. As indicated in the literature review, studies in the triangle of agricultural knowledge, society and technology are dominated by the positivist paradigm and quantitative studies. There is no study that deals with digital agricultural technologies as a social product within a sociological critical perspective, examining it with historical, social and political dimensions by employing an ethnographic method. In order to contribute to closing this gap in the literature, this study seeks to identify the ways in which digital agricultural technologies are experienced today by looking at their historical and social references. The sample of the study is Geyve, one of the important agricultural production regions of Turkey, and the technology it focuses on is digital climate stations, which are widely used in Turkey within the scope of digital agriculture transformation. In the first part of the study, the emergence of digital agriculture as decision support systems and its relationship with sustainable agriculture are given. The technical features, working principle, current situation in Turkey and the methods of creating and disseminating big data-driven information are mentioned. The first part is consisted of the literature on agricultural extension, communication, information and knowledge systems is included. The broad scope of agricultural communication is framed to focus on agricultural knowledge and information systems. An attempt has been made to provide a sociological perspective to the literature referred to, and the deficiencies in the literature have been addressed. Second chapter situates digital agriculture emerging as decision support system which is integrated in related process of agricultural knowledge and information systems and assesing its process of emergence.

The third, fourth and fifth parts of the study attempt to historicize and socialize digital agriculture and to make a mapping out from the present to the past. A comprehensive analysis of the historical and social construction process of digital agricultural technologies and the use of big data-driven information inherent in this technology which are intended to be disseminated within the scope of sustainable agriculture today, has been made. To do it, Foucault's method of the history of the present, genealogical approach is utilized. The third chapter explains conceptual framework of Science and Technology studies and the method of history of present, the genealogical approach and describes its application. The fourth chapter applies the history of present and periodizes Turkey's historical experience within the relationality of agricultural knowledge, technology and society. Due to Foucault's method, history is not seen as a linear flow, consisting of events one after the other. On the contrary, a periodization focusing on historical breaks, ruptures and discontinuities has been made. Through these periodization, certain breaks, transitions, discontinuities and power/knowledges related to agricultural structures have been tried to be revealed. A historical analysis has been made extending from today to the early Republic. This chapter, which can be seen as a genealogical analysis of digital agriculture, aims to reveal Turkey's historical experience in agricultural knowledge, technology and society. The periodization is revealed as 1923-1949, 1950s-1980s, 1980s-2000s, 2000s-today. In the fifth section, grey areas in the transitions between these periods are tried to be captured. In order to ensure that the genealogical analysis does not consist of macro analyses, it is tried to convey how the transformations in the process of dissemination of agricultural information are experienced by the farmers, and the transitions between the periods are tried to be revealed in the light of the experiences of the actors. This section also reveals the tension lines between scientific knowledge and farmer knowledge through the conceptualization of power/knowledge and examines the tactics developed by farmers against the authority of scientific knowledge. With a set of concepts borrowed from Cultural Studies, it attempts to understand farmer-engineer encounters through De Certeau's tactics.

The sixth and seventh chapters of the study analyze how digital agriculture and big data, which are subjected to a genealogical analysis, are socialized and communicated today. In the sixth part, the research design, method, sample selection, research questions of the field study conducted in Geyve are included. Within the scope of the field study conducted in Geyve between 13.04.2023-20.05.2023, 27 farmers and 14 engineers are interviewed. In-depth interview, participant observation, work and talk ethnographic, self-reflexive recording techniques are used in the fieldwork. In Chapter 7, the field findings are shared and the mind maps used to present these findings are given. The mechanisms of power/knowledge through which agricultural knowledge is socialized are identified. The mechanisms that reproduce power and those that create spaces of resistance are discussed separately. After the existing skeleton of socialization of agricultural knowledge has been removed, it has been analyzed how digital agriculture and big data-driven knowledge are socialized and in which ways they are articulated to this skeleton. Finally, the extent to which digital agriculture contributes to the sustainability of agricultural production is discussed.

In the eighth part of the study, the findings of the fieldwork and genealogical analysis are discussed together. It is discussed with its historicity, sociality and basic findings in the field, what socialization of agricultural knowledge and implications of digital agriculture ultimately points to in social theory. In the discussion, it is determined that some concepts in the literature are no longer relevant, new conceptualizations that analyze the current situation are included. In the conclusion, informed predictions and suggestions are made about the relationship between agricultural knowledge, technology and society. The study concludes with suggestions for further research.

Importance of the Study

The literature review reveals that studies on agricultural communication, extension, information, and knowledge systems which are interconnected to each other are predominantly influenced by the positivist paradigm, technological determinism, and quantitative evaluations. It has been observed that communication is considered with mainstream perspectives and technology and scientific knowledge are associated with progressive rationality. Thus, agricultural information is considered as a neutral message that is transferred from the source to the receiver through various communication channels. This study, on the other hand, is based on critical social thinking in the light of the interpretative turn, which enables communication to be considered as a social, cultural, economic and political element. It releases digital agricultural technologies from the limitation of instrumental reason and looked at its mutual relationship with the social. Based on the co-productionist framework of Science and Technology Studies, the study claims that technology and society are mutually constructed and evolve together. Employing Foucault's conceptualization of power/knowledge, the study tries to discover through which power/knowledge struggles digital agricultural technologies and big data are socialized. In doing so, it has made a genealogical historical analysis in the light of Foucault's method of the history of the present, and treated digital agriculture as a historical and social product. Then, with fieldwork, it has revealed today's socialization processes and the ways in which agricultural knowledge is communicated from a qualitative, interpretative perspective. Finally, the study, which addresses the field findings together with historical analysis, has put forward new conceptualizations and aims to contribute to critical social theory. The study is important because it is the first doctoral thesis that aims to break the positivist paradigm in agricultural extension and communication literature with its conceptual framework, research design, methods and techniques. It is also significant that this study is capable of presenting grounded informed predictions about the future as a result of evaluation of field work with historical analysis.

Questions and Sub-questions of The Study

The main concern of the thesis is around the inquiry "Through which power/knowledge mechanisms is agricultural knowledge socialized in which digital agriculture is integrated?”. Today, the term "digital agricultural technologies" specifically refers to the utilization of big data in agricultural production, with the purpose of promoting sustainability. The production and distribution of big data are closely linked to the socialization of agricultural knowledge. Sub-questions are formulated to assess digital agriculture as a historical and social entity, uncovering its impact on the socialization of agricultural knowledge. This is carried out in order to understand how digital agriculture integrated to socialization of agricultural knowledge. In this context, sub-questions are listed as follows:

1. Through which historical and social processes are digital agricultural technologies derived? Which breaks, discontinuities and transformations enable digital agriculture today?
2. How are digital agricultural technologies and big data-driven knowledge being diffused today?
3. Through which power/knowledge mechanisms is agricultural knowledge socialized?
4. Which type of tactics is formed with the struggle of power/knowledge creating resistance?
5. In which ways are digital agriculture and big data-driven knowledge integrated into the socialization of agricultural knowledge?
6. To what extent does digital agriculture ensure sustainability in agricultural production?

1. FRAMING AGRICULTURAL COMMUNICATION WITH A FOCUS ON AGRICULTURAL KNOWLEDGE AND INFORMATION SYSTEMS

In 2016, I participated in an academic conference in USA which focused on the intersection of technology and design. As a food engineering graduate working as a research assistant with a keen interest in communication and cultural studies, I attended sessions that were relevant to my areas of interest. My interest in agriculture was sparked during my undergraduate studies in food engineering. I felt a strong inclination to shift my focus from building food processing systems in factories toward interacting directly with the soil, rain, and sun. During one of the sessions, I learned that the University of Georgia offers an undergraduate and graduate program named Agricultural Leadership, Education, and Communication. It was my initial encounter with the term "agricultural communication". During the session, I encountered the designated individual and inquired about my concerns. She explained that the "Agricultural Leadership, Education, and Communication" programme focuses on the ways in which agricultural knowledge ranging from food security, nutrition, agricultural economics and sustainability is communicated among relevant stakeholders in intersection of anthropology, sociology and communication sciences. The convergence of agriculture and communication has been very thrilling to me ever since. This thesis emerged as a product of this excitement.

The discipline of agricultural communication basically covers communication processes that focus on the process of transferring agri-food information to relevant stakeholders (Doerfert, 2021). Such information ranges from the production to the consumption of agriculture, food and livestock, and both stakeholders and forms of communication may vary. Recently, the convergence of agricultural communication with media studies has increased. The focus of the field is shifting towards the representation of agriculture in the media, agricultural journalism, farm broadcasting, and agricultural editorship. On the other hand, studies have been carried out on the transfer of agricultural knowledge and technology to relevant stakeholders, forms of communication between stakeholders, and the establishment of information networks. The connection of agricultural communication with agricultural information processes is established through agricultural extension activities. In this sense, agricultural communication literature is intertwined with agricultural extension studies. This interconnection is also evident through the combination of terms in the curriculum of agricultural faculties under the heading "agricultural extension and communication courses".

The ethimology of the term “extension” is based on the Latin words "tensio" meaning "to stretch" and "ex" meaning "from outside", and refers to a kind of "reaching out" (Ignou, 2019). The incorporation of the term "extension," which mostly pertains to the spread of education, into agricultural production occurred throughout the early 20th century in the United States. The reason why the discipline of agricultural communication, which I observed in my personal story in the University of Georgia is strong in America may be due to the fact that the agricultural extension perspective was developed there. In 1914, the Smith-Lever Act was passed by Congress, establishing the Cooperative Extension Service. This network of educators, spread across state lines, aims to "extend" academic knowledge to the entire nation. Cooperative Extension is a collaborative educational initiative established by the U.S. Department of Agriculture and the land-grant universities throughout the country (Danbom, 1979). The act was signed with the purpose of disseminating valuable and practical information among the American population regarding agriculture, the utilization of solar energy in relation to agriculture, home economics and to promote the implementation of scientific knowledge. Agricultural extension, usually referred to as agricultural advisory services, has a crucial role in spreading knowledge and information among researchers, farmers, and other participants in the agri-food system. It also helps in promoting the development, adoption, and local customization of new farming methods (Benin et.al., 2010). Agricultural extension, commonly referred to as farmer education, facilitates the incorporation of scientific research and new knowledge into agricultural methods by means of educating farmers. From the early 20th century to the 1980s, the field of agricultural extension was primarily influenced by progressive rationality, technological determinism, and a positivist research paradigm. The primary emphasis of this method was on the transmission and dissemination of technological advancements. To do this, the approach proposed by

Everett Rogers in his work "Diffusion of Innovations" was utilized (Isgren, 2023). Moreover, the transmission of scientific knowledge was deliberately designed to be unidirectional and hierarchical. As a result, the Shannon Weaver model, which illustrates one-way communication from sender to receiver, was embraced (Telg and Irani; Budak (2020). In this context, there are some particular methods need to be applied towards technology acceptance, persuading the farmer and creating behavioral change. These methods that are developed by behavioral science departments of the universities in USA and England (Cinemre, 2001: 32-33). Some of them could be listed as:

- Farmers should feel safe. They should not feel that they were ruling by foreigners, they should feel that they always have an option.
- Time is the most precious element in agriculture and in a farmer's life. Extension stuff should make the speech short and simple. They should make an impressive introduction that catch their attention.
- Before interviewing the farmers, the extension staff should search the related village and production patterns. They should not go with products that are not suitable for the production pattern of that region. It is also necessary to act according to the socio-cultural codes of the village and to avoid discourses contrary to the beliefs and lifestyles of the farmers.
- Local leader of the village should be persuaded at first. Farmers who see this would be persuaded easier.
- Demonstration should not be left in the beginning. It should be continued until receiving the end result. Showing the results to the farmers will increase their persuasion rate.

The reflections of behaviourism in the adoption of innovations and the one-way flow of information in the communication of agricultural knowledge in Turkey is evident in Yurttaş's (1991:2) definitions of agricultural extension. According to him, agricultural extension is an integrated act and has five basic features:

1. Agricultural extension is a public service that addresses farmer and entire farmer family.
2. The principle in agricultural extension is not to do the farmer's work but to help them to accomplish their task better. Its basic principle is expressed as "helping farmers so that they can help themselves." Agricultural extension is a voluntary work. Farmers can't be forced. They should be persuaded to apply modern agricultural practices.
3. Agricultural extension is a voluntary educational system that operates outside of conventional educational settings. It is an activity aimed at providing a deliberate change or development in the knowledge and skills of farmers in the desired direction. Farmers are systematically persuaded to apply modern agricultural techniques and to change type of their production according to scientific knowledge.
4. Agricultural extension can take place in the village square gardens, coffeehouses, fields or in the households. It has no specific place but should be done at regular intervals.
5. Agricultural extension is a technical work. Extension staffs bring information about research findings, new technics to farmers and help them to improve agricultural production.

Until 1980s, agricultural extension is defined as the practice of government-employed agricultural professionals, such as engineers and technicians, who aim to improve farming processes by demonstrating new inventions and imparting useful knowledge to farmers (Kazbekov and Qureshi, 2008). It is associated with facilitating desirable changes in farmers behavior, encompassing modifications in knowledge, abilities, and attitudes. Extension was considered as the dissemination of information that would strengthen input-intensive agricultural production and aimed to modernise agricultural production. On the other hand, with the rise of private advisory systems in 1980s, participatory methodologies emerged. It is accepted that every farmer has unique information needs and should have options to meet this need (Vonk, 1990; Leeuwis, 2006). Heterogeneity of information needs reposition farmers as cost-sharing agents and transform advisory services from supply driven to demand driven. The concept of the "transfer of technology perspective" as a linear process has largely been discarded in favor of a participatory approach that emphasizes direct engagement with farmers and determining and fulfillment of their particular information needs.

Aligned with the increasing adoption of a participative approach, in 1986, Röling introduced the term "Agricultural Knowledge and Information System" to promote the integration of system thinking for the purpose of mutual learning and the generation, sharing, and utilization of technology, knowledge, and information linked to agriculture. The system facilitates the collaboration of farmers, agricultural educators, researchers, and extensionists to effectively utilize knowledge and information from many sources in order to enhance farming practices and enhance lifestyles. Given the rapid pace of technical advancements, Röling and Engel (1991) primarily emphasizes the impact of these advancements on agricultural research and extension, particularly in terms of technological change and innovation. Avoiding "one size fits all" approaches, Agricultural Knowledge and Information System (AKIS) facilitates the connection and collaboration between farmers, researchers, agricultural educationists, and extensionists. It promotes the exchange of knowledge and fosters the utilization and dissemination of agricultural technology, information, and expertise (Berdegeu and Escober,2001). Farmer communities play a crucial role in the knowledge triangle (research, extension, farmer) that has been established. This study, which explores the forms of socialization of agricultural knowledge and the implications of digital agriculture, frames agricultural communication that covers multidimensional research area, with a the focus of agricultural knowledge and information system.

1.1. Agricultural knowledge and information system (AKIS) studies: Approaches and models

Agricultural Knowledge and Information System (AKIS) is a term developed by Röling and Engel (1991) that is based on system thinking towards knowledge and information flows in agriculture. System thinking is a way of making sense of subsystems that are interacted, interrelated or independent parts that form a complex whole that has a particular purpose. It is a framework for observing interrelationships, linkages and patterns rather than separate entities (Ngyuen and Bosch, 2013). It also offers a conceptual framework to analyze existing system and design an improved one. Based on the argument of system thinking is able to applied any subject (Spedding 1988), Röling and Engel (1991) applied this approach to agricultural information flows and states of knowledge. System thinking is used to address complex, linked information flows within various agricultural actors and institutions, providing an approach to agricultural knowledge and information systems (Bagnall-Oakeley and Ojilaje, 2002). Röling defines (1989: 33) AKIS as follows: "a system in which agricultural information is generated, transformed, consolidated, received and fed back in such a manner that these processes function synergistically to underpin knowledge utilization by agricultural producers". Accordingly, AKIS helps to identify basic components, actors and subsystems to understand and examine how information is generated, communicated, used and managed by different actors of the system and how actors are interacted through various networks (Demiryürek, 2000). It also helps to analyze how the system operation needs to be developed in a particular purpose.

AKIS approach is developed in response to the one-way, linear technology and knowledge transfer paradigm that prevailed until the 1980s (Taluğ, 1993). According to technology transfer paradigm, there are three subsystems connected sequentially to each other as an end-of-pipe respectively as experts- transfer-farmer. (Berdegué and Escobar, 2001).

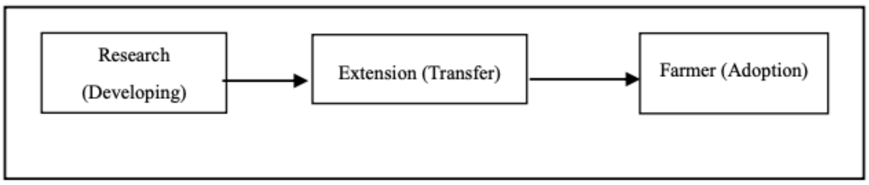

Figure 1-1: One way technology transfer paradigm in agricultural extension
Reference: (Röling, 1988)

On the other hand, according to participatory paradigm which AKIS is based on, farmer is not only a passive recipient but is a key actor that needs to be involved in the production and extension of information and technology (Demiryürek, 2000). In other words, within this approach the subsystems of AKIS researchers, extensionist and farmers participate collaboratively in information and knowledge generation (Özkaya, 2019). While the technology transfer paradigm proceeds in a linear chain, the participatory approach consists of intertwined links of researchers, extension workers and farmers. The Agricultural Knowledge and Information System (AKIS) refers to the reciprocal exchange of information and knowledge between research institutions, extension organizations, and farmers.

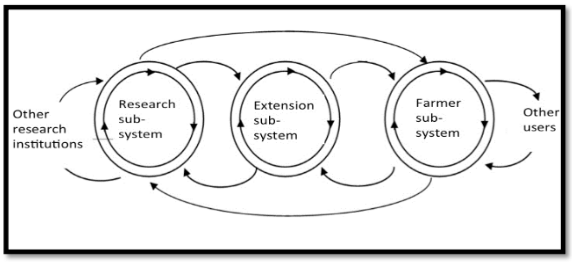

Figure 1-2: Participatory paradigm diagram in AKIS
Reference: (Röling, 1988)

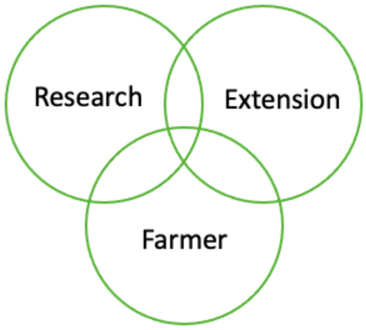

Figure 1-3: Diagrams of interactions of participatory paradigm
Reference: (Özkaya, 2009)

The AKIS participatory paradigm rejects linear information dissemination systems and instead promotes a collaborative approach that involves bottom-up information flow and horizontal linkages among contributors. It has become an integrative, inter-organizational phenomenon that foster systemic learning that bring different actors from public, private and NGOs that are relevant to system such as farmers, advisory services, civil society, policy makers. Islam (2010) provides a definition of AKIS is a complex network system that encompasses various actors, relationships, policies, knowledge sources, communication techniques, knowledge creation and sharing, information exchange, and decision-making processes for development purposes. The AKIS concept has been extensively employed as an analytical tool to examine the individuals who provide specific knowledge and information for agricultural decision-making, the communication of information and knowledge among different actors, and the enhancement of information networks to support system management (Poudel, 2015). There are particular models that is developed based on knowledge triangle of AKIS which is the linkage of research, extension and producer. Firstly, FAO and World Bank (2000) develop an AKIS model that outlines the importance of agricultural education in knowledge triangle and situate the information needs of farmers in the center to lead farmers in a better farm management.

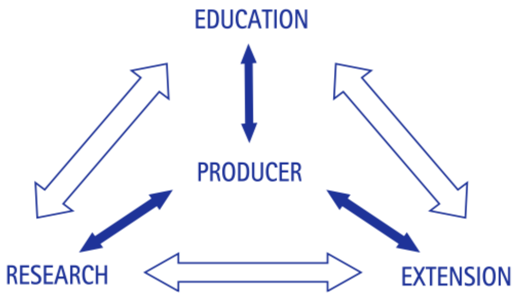

Figure 1-4: AKIS model – Participatory approach to knowledge triangle
Reference: FAO and World Bank (2000)

In this model, the importance of agricultural education for rural development is implicitly emphasized to promote mutual learning. It represents a reciprocal connection between institutions and end-users of knowledge; education and research institutions and farmers Yet, it is noticed that this model does not include as private advisory organizations, pesticide dealers, wholesalers who have also close relations with farmers (Berdegué and Escobar, 2001). Hence it is updated to include non-public information networks with the name of decision support (Rivera, Qamar and Mwandemere 2005) which transforms the knowledge triangle into four subsystems respectively as 1) information generation subsystem (research); 2) information diffusion subsystem (extension); 3) information utilization subsystem (agricultural producers) 4) the agricultural support subsystem (agrochemicals, technology, big data analytics, support systems)

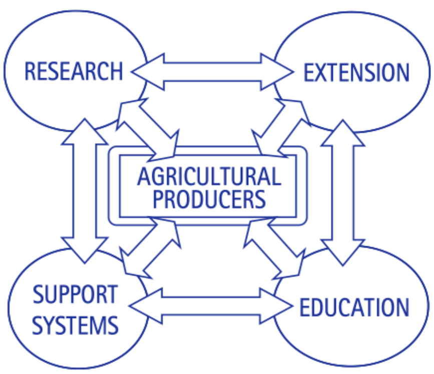

Figure 1-5: Four-pillar quadrangular model of AKIS
Reference: (Rivera et.al., 2005)

This four-pillar quadrangular model is regarded as an idealized AKIS model for empowering farmers and contributing rural development (Munyua, 2005). It is emphasised that this model opens traditional AKIS approach by recognizing importance of market oriented agricultural innovations and crossing connections of both public and private sector entities. (Berdegué and Escobar, 2001). It is also important to note that technology as an input is integrated into AKIS within the pillar of “decision support systems”. This model is further improved by Rivera et.al (2005) including relevant components that surrounds and influence four subsystems of AKIS such as government policy, institutional commitment, communication systems and human resources This improved model is called a comprehensive AKIS for rural development.

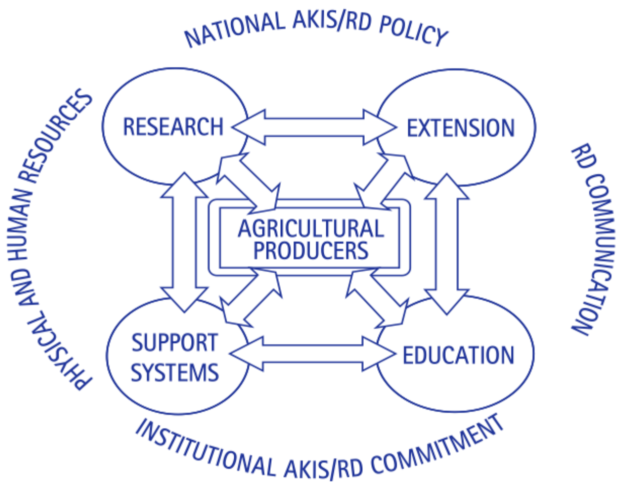

Figure 1-6: Comprehensive model of AKIS
Reference: (Rivera et.al., 2005)

Rivera et. al. (2005) states that this comprehensive model is based on community-driven development and strengthening of linkages and interfaces between actors of AKIS is linked to wider social and political systems. (Munyuva, 2005). With this model, AKIS is opened to conceptualized as a system more than sum of four subsystem but is situated in relation to surrounding social, political and economic structures. Due to the fact that the aim of this approach is promoting a community-driven development, it situates farmers as key actors by emphasizing their social being. Indeed, this approach promotes actor-oriented framework in AKIS studies with utilization of the comprehensive model.

Actor-oriented framework of AKIS

The comprehensive model of AKIS allow to examine agricultural knowledge in relation with social and political systems and situate farmers' need in the center. In the context of comprehensive model, actor-oriented framework which a critic approach that refuse the arguments of technological determinism reducing information exchange and participation a neutral human activity is widely used. Scholars that evaluate AKIS from actor-oriented framework (Checkland&Howell, 1998; Leeuwis 2004) emphasize that processing information and its integration to state of knowledge is a social process. This approach tries to reveal how the agricultural information and knowledge system works, identify who the related actors are, how these actors relate and link to each other, and in what ways these relationships need to be transformed to make AKIS farmer-driven. In this context, Matseart et al. (2005:101) offer actor-oriented tools to analyze AKIS of given regions to identify the key actors of the given system, the timeline that shows historical changes of established relations and information flows, the linkage matrix, linkage maps of actors. Matseart et. al (2005) conduct actor-oriented framework tools for examining the AKIS of Bangladesh in chili production. Firstly, they make a timeline to identify key actors, creating timeline, their historical roles and also to show changing dynamics of AKIS with the timeline.

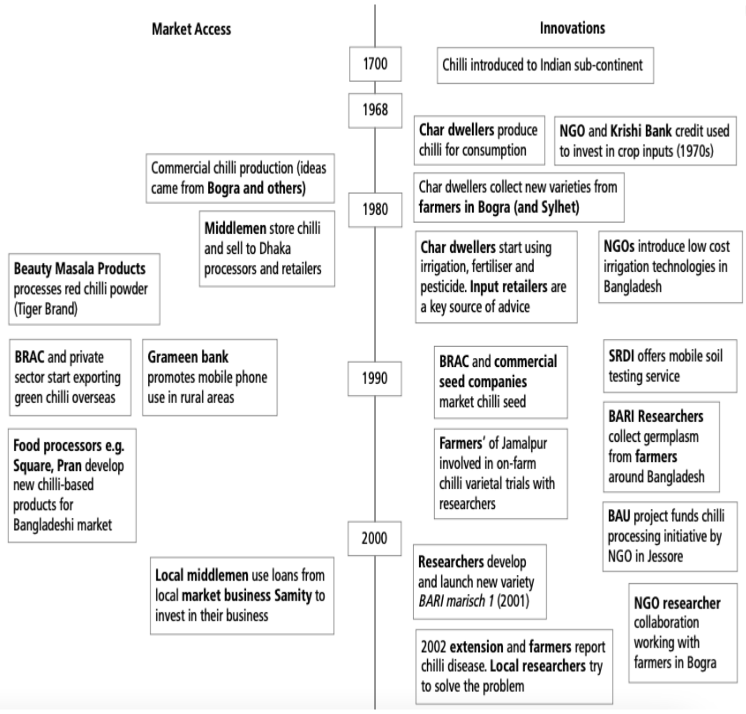

Figure 1-7: Timeline of actors in chili production in Bangladesh
Reference: (Matseart et. al., 2005)

Matseart et al. (2005:101) express that a timeline is generated by literature review and conducting in-depth interviews. They indicate that actor-oriented approach attempts to situate information flows and related actors into historicity and sociality (Mateseart et.al.2015). By creating timeline, the history of agricultural knowledge and technological innovation system can be revealed based on significant changes and the key actors over time. Drawing a timeline is the starting point of actor-oriented analysis as it helps to identify historical changes of key actors, their roles in society. It also helps to reveal how technological innovation is transformed with social interactions such as how it started and how it proceeds at the present and where it is heading. In other words, it provides a historical trajectory for agricultural and information systems developments. Furthermore, actor linkage matrix allows to examine linkages of many actors to get involved in AKIS indicating the given values from strong to weak ones with colors or signs. As for Turkey, in the study entitled by "The Analysis of Information Systems for Organic and Conventional Hazelnut Producers in Three Villages of the Black Sea Region, Turkey" Demiryürek (2000) apply actor-oriented tools and explore an actor linkage maps to analyze the information systems of Samsun within historical experience of Turkey. It analyzes the emergence of linkages through various actors in the course of Turkey's AKIS. Components of information system, linkages, information flows are determined based on survey's data. By evaluating survey, AKIS of hazelnut production comparing organic and conventional in Samsun is revealed with the recommendations to improve existing AKIS to be farmer-driven.

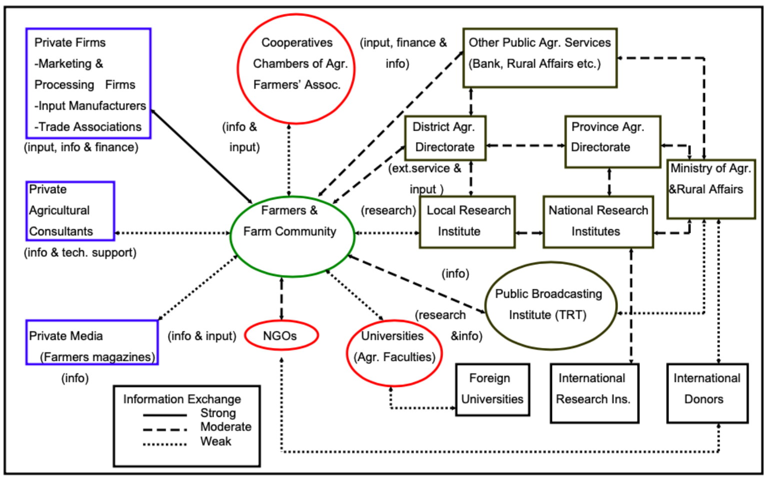

Figure 1-8: Model of agricultural information system of Turkey and its networks
Reference: (Demiryürek, 2000)

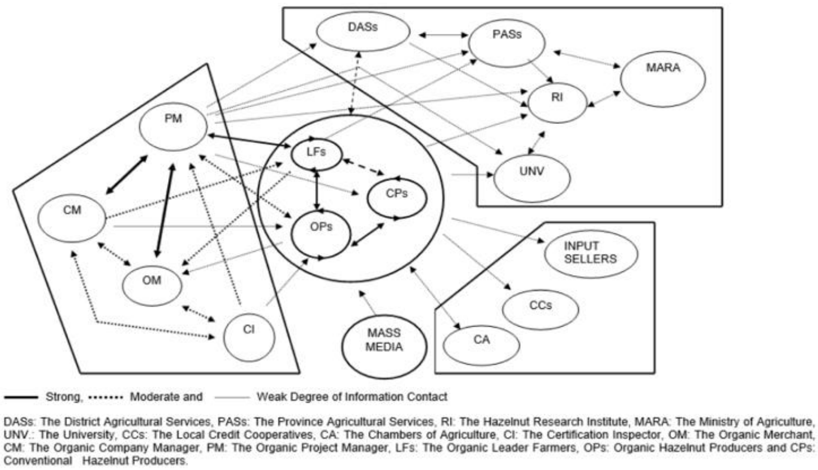

Figure 1-9: Model of total hazelnut information system and its networks
Reference: (Demiryürek, 2000)

In actor-oriented studies quantitively thinking and creating network diagrams based on surveys are dominant. In other words, sociality of actors is tried to be analyzed with structured quantitative question under the category of socio-economic status of farmers (Boz et.al. 2004: Daudu, 2009; Swanson, 2010; Demiryürek, 2010; Munyua, 2011; Deliktaş, 2013; Poudel, 2015). In this approach, the socialization of agricultural knowledge is limited to the identification of relevant actors and the historical transformation of their positions. Pointing out and diagramming the connections between actors does not convey how knowledge is socialized and how knowledge/power struggles are experienced. I argue that the emphasis of Matseart et.al (2005) make on situating actors in their historicity and sociality entails socio-scientification of AKIS models. Likewise, four-pillar inclusive AKIS model that Rivera et.al (2005) propose indicate evaluation of AKIS with wider economic, social and political systems. Also, Munyua and Stilwell (2012) state that integrating social scientists help to explore farmer's world and hear their words while determining information networks and situating actors in their historicity and sociality. They imply studying of information and knowledge in social science help to situate actors and consider farmers as social beings. They state that conducting social science research help to consider AKIS itself is communicatively constructed and operated according to the interactions of different social realities. They claim that scholars using social sciences paradigms become capable of understanding the meaning of knowledge and information systems with respect to different social realities. Escaping from dictates of positive science, paradigms of social science help to understand how farmers make sense of information flows, technology and interact with them.

Conceptualizing knowledge and information systems as social systems requires an ethnographic gaze in research methodology. The perspective of sociology of knowledge that investigates the social mechanisms by which knowledge is generated, disseminated, and obtained that explores social conditions of knowledge (Mannheim,1985) needs to be introduced with the studies of agricultural information and knowledge system. Orienting social scientific gaze towards actor-oriented AKIS entails sociological, anthropological and feminist interpretations (Munyua and Stilwell, 2012, Durrheim, 2006). To explore social references of agricultural knowledge, the Archimedean point can be asking in which ways social networks are constructed with which type of information. Addressing questions for whom agricultural knowledge and information is generated and disseminated help situating actors of AKIS within their historicity and sociality as Matseart et.al. (2005) draw attention. Below, I mention studies that analyze generation and utilization of agricultural knowledge and information from different perspective of social sciences.

1.2. Questioning social dimensions of agricultural information and knowledge

First study I mention emphasizes the importance of developing agricultural anthropology approach into utilization of agricultural information and knowledge to reveal human element in agricultural activity. Rhoades (1981) asserts that developing an anthropological view toward agricultural knowledge and information allow us to as it as a multifaceted human construct that encompasses socio-cultural and ideological components in a reciprocal way. By developing interpretive approach, it can be revealed that how individuals accept and make sense of information and participate in generating knowledge. Rhodes et al. (1981) conduct research in Potato Center in Peru to generate farmer-oriented approach to solve farm-level technological problems and transfer scientific knowledge to farmers. According to reports of the center, farmers of the region need a better storage system to prevent potato losses. A team of researchers consisted of biological scientists and social anthropologists explore post harvesting activities and try to solve the storage losses problem. Biologists propose that farmers utilize a well-established scientific theory which states that natural diffused light can decrease sprout growth and enhance the overall quality of seeds. From a biologist’s point of view, this principle is a practical application that improves seed quality and yield. The anthropologists are concerned whether this scientific knowledge is proper and acceptable for farmers. They admit that farmers do not necessarily regard undersized, shriveled, or damaged potatoes as losses or waste. They use them to feed animals or used as seeds. In addition, they also argue partially spoiled, shriveled potatoes are sometimes preferred in terms of culinary preferences of the region. Biologists try to solve the losses problem for farmers that are not necessarily perceived as losses by farmers. This study shows before analyzing the information flows of AKIS, understanding farmer's world, the socio-cultural conditions and viewing the technology and scientific knowledge through the eyes of farmers are necessary.

Moreover, Nazaera (2017) questions the role of indigenous knowledge of farmers in protecting biodiversity. IK is described as accumulated, experience-driven information through trial and error which is transferred from generation to generation. Regarding people who use and keep indigenous knowledge (IK) as local custodians, Nazaera states that local custodians turn to be a key actor to underpin sustainability as they are embodied to contextually sensitive knowledge. It is claimed that generating two-way participatory extension activities entails integration of local custodian's experience. Otherwise, planning innovations in agricultural information and knowledge systems without considering IK and its embedded social conditions have not brought fruitful results in farmer's world. Taluğ et.al (1993) also indicate farmers' indigenous knowledge is ignored against the scientific authority of technology. In other words, the accumulated experience-based information of farmers is not seen as a knowledge as for scientific researches. The study advocates that designing an actor-oriented AKIS requires integration of IK and understanding farmer's social conditions. They list the benefits of integrating indigenous knowledge to AKIS as follows:

- Identifies the best farmer practice in the region and transfers it to other farmers
- Provides detailed information on local conditions affecting agricultural production (rainfall patterns, indicators of seasonal transitions, local pest control methods)
- Identifies locally adapted varieties and resource management
- It reveals the local criteria necessary for technology development and local relevance.

The study also emphasizes the need for well-trained extension staff who are also local responsive to collect first-hand information of indigenous systems properly and communicate it between communities and researchers. The study concludes that it is important to integrate social scientists into AKIS studies to understand the world of farmers and how utilizing indigenous knowledge increase resilience against decontextualization of agricultural intensification. It is stated that industrial agriculture decontextualizes the knowledge of local custodians and replace scientific explanation of chemical inputs. As emphasized in previous chapters, within the execution of Marshall Plan in Turkey, rationalization and standardization efforts were initiated into agricultural production. Experience and knowledge of the human-nature relationship is determined by capitalist relations. Ecological knowledge has been replaced by economic knowledge, the priorities of the market have become prominent, ecological dimensions in agriculture have been rendered invisible thereby agricultural products and knowledge about them have been commodified. Keyder and Çağlar (2020) also stated that the priorities of the market have led to the loss of indigenous knowledge in agricultural production. Under the competitive pressure of the market, it is stated that the pesticides used to maximize productivity and intensive industrial agricultural methods overtake indigenous knowledge. Stating that indigenous knowledge is embedded in oral memory and inherent in production practices, the authors state that with the industrialization of production activities, the ground that ensures the ownership, reproduction and transfer of indigenous knowledge began to disappear.

In addition to this, several studies draw attention questioning the gender of actors while addressing sociological thinking to actors of AKIS. Scholars argue that agricultural technology development and its extension affect women and men differently in terms of labor requirements and empowerment (Lambert et al. 2016; Najjar, 2019). Scholars indicate in a farm family, the more male farmers own the lands and involved in capital management, the less female farmers having limited access to insurance, credit options and information sources in making decisions (Damisa and Yohanna, 2007; Alwang et al., 2017). Inequality in access to resources become socio-economic characteristics of women and due to gender-based division of labour male farmers are regarded as the farmer, boss and manager while female farmers are regarded housewife, assistant of husband and labourer. Within patriarchal farm management, decisions made by male farmers reinforce the gender-based division of labour. As for using technology and utilizing information, Gupta (2015) questions whose labor is saved and for whom the technology and knowledge help to facilitate resource management. Doss emphasizes diffusing new agricultural technologies and knowledge might increase the labour burden of women by assigning them additional tasks. To illustrate, she indicates that applying fertilizer leads to the need for more weeding which is done by women. Hence in that case such as a development increases the amount of time women work in the field. Studies discuss how agricultural innovation and knowledge might reinforce the gendered division of labour (Momsen 2010; Diaz et.al.,2019). It is argued that women farmers lose control over market niches, management of resources and men take over marketing of crops whose production is dependent on women's labour. The fact that men have established capitalist relations and are part of certain capitalist networks lead them to become decision-makers in agricultural production. In other words, planning production, management of both natural and monetary resources become patriarchal activities that underpin capitalist relations in agricultural production (Momsen, 2010; Hellin, 2010). In this context, I argue that feminist environmental studies such as ecofeminism help addressing the relationship between the gender of AKIS actors and the ways of utilization of information and knowledge.

Ecofeminism theorizing links between women's oppression and the domination of nature. It emphasizes that west's treatment of ecology is based on nature/culture dualism and constructs human identity within culture and outside of nature. This way of thinking identifies human with the instrumental reason that dominates nature. Plumwood (1993) and Shiva (1998) detect there is a masculine presence in the continual dominance of nature by rationality that engenders progress and development. They assert that in case of human/nature dichotomy, human is attributed to man as woman is associated with nature which also underpins public/private dualism. Plumwood implies the links of the domination of nature and of women by focusing in patriarchal discourses that explains women's reproductive labour with women's being goodness, the purity, patience, self-sacrifice and maternal instinct of them. Patriarchy attributes the virtue of "angel in the house" to women to explain their invisible work, the role they play in reproduction in such a way to reinforce women's devaluation and oppression. This "good woman" argument has replaced by the affirmation of "angel in the ecosystem" in agricultural labor. This essentialist approach which identifies the fertility of the land with women's fertility, renders women's care labor in agriculture and animal husbandry invisible. The gender hierarchy on to the nature/culture distinction has major impacts on the kind of relationship men and women have with nature and the kind of knowledge they gain from these experiences.

This discourse also absolutizes the workload assigned to women as a result of the gendered division of labor. As a consequence of the dualism-driven division of labor such as nature/culture/ - women/men/ - private/public, women provide the labor required for production (crop cultivation, hoeing, harvesting, animal care, milking) while men carry out capitalist relations such as bringing the product to the market, providing the tactics and networks necessary for promotion. For example, as a result of the gender-based division of labor, women pick fruits and men sell it. While women are on the production side of the agricultural business, men are involved in the commercial dimension (Plumwood,1993). On the other hand, this situation accelerated men's alienation from nature and subjected agricultural products to commodification by valuing them at market value. Women, on the other hand, are less alienated than men within the course of history, as they relate to nature without being directly integrated into capitalist relations as a result of the gender-based division of labor. This might explain why women are often the guardians of local knowledge or local custodians of indigenous knowledge. This social, historical position indicates that there are significant differences between women's agricultural knowledge and networks and those of men as a result of the gendered division of labor.

These studies approaching agricultural knowledge from the perspective of sociology of knowledge are excluded from the literature on agricultural communication, agricultural extension, agricultural information and information systems. Although with the rising participatory approach in the 1980s which is based on the mutual interaction between scientific knowledge and farmers, technological determinism has been diminished to a certain extent. Yet positivist paradigm continues to be dominantly applied. Studies on agricultural communication, agricultural extension, agricultural information and information systems are carried out with quantitative research methods. The establishment of reciprocity, the participatory approach is tried to be understood from short-term survey studies and information network diagrams.

Based on the co-productionist framework under Science and Technology Studies, this study explores the ways in which agricultural knowledge is socialised and communicated, and seeks to understand the impact of digital agriculture on this. The comprehensive model of Rivera et.al. (2005) offers rich opportunities for linking STS to the literature on agricultural knowledge, with reference to the interrelationship between technology and society. In other words, technological developments are integrated in knowledge triangle (research, extension, education) in extension studies as a separate pillar and results in knowledge quadrilateral. This quadrilateral is also attached with wider political and economic systems. Treating agricultural actors as social actors, analyzing information and knowledge systems in conjunction with political, economic and social systems, provides a convenient link to treat digital technologies as a separate stakeholder influencing the communication of agricultural knowledge. Therefore, the critical engagement of STS with technology is linked to the agricultural information and knowledge literature through the comprehensive model of AKIS. Within the scope of the macro dimension of the model, the historical connections of agricultural knowledge have been revealed and how it is shaped by political fractures has been revealed. For this, Foucault's method of the history of the present was followed and a genealogical analysis was made. Within the scope of the micro dimension of the model, how agricultural knowledge is socialized is examined and the positivist paradigm in the literature is attempted to be broken. In order to understand how the knowledge quadrilateral is socialized, Foucault's conceptualization of power/knowledge was put to use and an ethnographic field study was conducted. In line with the model, digital agriculture is considered as a separate factor affecting the formation of agricultural knowledge, and the way in which it is included in socialization mechanisms is revealed. In the next section, what digital agriculture is, how it emerged as a support system, and its relationship with agricultural knowledge will be explained before moving on to the historical and social dissolution phase.

2. DEVELOPMENT OF DIGITAL AGRICULTURE AS DECISION SUPPORT SYSTEMS: CASE OF DIGITAL CLIMATE STATIONS

Agriculture is the practice of cultivating land, growing crops, and raising livestock. Humans dedicated themselves to convert raw materials into consumable goods around 10.00 years ago by domesticating plants and animals (Miller and Wetterstrom, 2000, p.1125). Since then, agriculture has been revolutionized over time. From the Neolithic Revolution and to the present, the way of agricultural production, decision-making process of farmers have changed. Today, there is a rapid population growth which has driven the demand for more food, water, and energy alongside the growth in demand for using natural resources. On the other hand, world has increasingly been facing severe climate change impacts such as extreme heat waves, rising sea levels, and warming oceans. While climate change put many pressures on agriculture, it also has a central role in climate change. In short, agriculture is affected by climate change while it contributes to it. Therefore, producing food sustainably for a growing population on a planet with scarce sources is one of the riskiest tasks and greatest challenges of our time. Food producers have to make more complex decisions on using the land, planting the seeds, growing crops and raising livestock under the effects of climate change. In this context, advancement of digital technologies is expected to provide particular solutions to overcome these challenges and help farmers to transform farming activities to become more environmentally friendly (Balasundram et.al., 2023).

Farmers have been experiencing changes of climate change such as deviations in temperature, shifts in the seasons, extreme weather events, water shortage and unpredictability of the deviations have been posing serious risks on continuing agricultural production. Farmers need more information that provide predictability while confronting climate deviations. In this context, it is agreed that digital agriculture brings the promise of various gains in terms of providing data-driven information to farmers and leading them to make timely decisions with more predictable and sustainable results (Wolfert et.al., 2017). Utilizing digital decision support systems, regarded as a digital agriculture solution, for combating the negative impacts of climate change on agriculture is recommended as they provide precise climate data to farmers and support agricultural decision-making (Ingram and Maye, 2000).

Digital agriculture encompasses the utilization of information and communication technology, as well as big data, in fully automated systems derived from precision agricultural technologies. Precision Agriculture (PA) refers to the implementation of electronic monitoring and control systems in agriculture. This includes the targeted application of inputs, precise timing of operations, and monitoring of crops and staff (Lowenberg, 1999:275). The components encompass specialized tools, software, and IT services, such as a satellite positioning system (GPS), an automated steering system, geo-mapping, remote sensing and variable rate technology. There are various usage areas of PA technologies such as operating agricultural drones to pest management, utilizing satellite based normalized difference vegetation index (NDVI), variable-rate applications, autonomous tractors, agricultural decision support systems and so an. This study focuses on agricultural support systems (AgriDSS) which are used for precision agriculture.

AgriDSS is designed to assist farmers, agricultural experts, research workers or any intellectual who require guidance in making various farming decisions. The system helps them to receive and analyze real-time data about the conditions of pesticides, crops, soil, irrigation, hyper-local weather predictions and so on (McBratney et.al.,2005). By acquiring and processing vast amount of agricultural data, AgriDSS helps farmers make decisions based on real data to gain more profit and the least effect on environment (DeBoer, 1999). In other words, AgriDSS collect data from sensors in the fields and improve farmers' ability to identify requirements of fields in terms of water, fertilizers and pesticides. Farmers can prevent the land from excessive use of additives while reducing the costs of products (Rübcke et.al,2022). AgriDSS is designated to the use of risk management and ensure efficiency, productivity and quality in agricultural system.

Human beings have cultivated lands to obtain food to survive since ancient times. This practice, agriculture, has always depend on environmental conditions. Growers always have to decide whether the soil is ready to sow the seed, whether harvesting time has arrived and so on. Decision-making process related with farming has been evolving in terms of technological changes. Agriculture 1.0 is defined as a mode of production that heavily depends on manual labor. Farmers were experiential and making intuitional decisions by observing repeated nature events (Nuthal and Old, 2018:30). In Agriculture 2.0 where agricultural machines, pesticides, synthetic fertilizers, and hybrid seeds entered in the mode of production, farmers started to receive consultancies from farm advisors[1]to reduce the risks in agricultural actions. The way farmers receive decision support has changed with the rapid development of computing and electronics, spreading the use of GPS, data-driven agriculture called 3.0 has been introduced by the name Precision Agriculture (PA). In this phase, farmers are enabled to receive real-time data which support them to predict the results of climate change and reduce financial risks. Today, Agriculture 4.0 where fully automated smart systems and remote-control mechanisms that possess artificial intelligent in farming management has been discussed. In this context, the process of decision make is autonomous. Smart farming where farming management is fully autonomous is not common Turkey. Yet, precision farming where decision support systems are integrated into agricultural production with the help of information and communication technologies has been increasing. Digital agriculture has become a comprehensive term that can include both smart farming and precision agriculture. In Turkey, it refers to the development of precision agriculture technologies especially decision support systems rather than fully automated systems.

2.1. Development of decision support systems in agriculture

Decision Support System (DSS) is defined as a computer-based system that aid processing or decision-making (Finlay,1994). Turban et.al (2007) defined DSS as an interactive, flexible, and adaptable computer-based information system, especially developed to manage rapidly changing problems and improve decision-making. DSS which is a computational information system that is based on mathematical and logical models. It first started to evolve from the theoretical studies of organizational decision-making at Carnegie Institute of Technology during the late 1950s and become a research field today (Bakker-Dhaliwal et al.,2001). The system is not designed to replace decision maker. Its aim is to help decision maker to be more effective and efficient. A typical DSS can be divided into four subsystems as Database Management Subsystem, Knowledge-based Management Subsystem, User Interface Subsystem and

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[1] in Turkey they are *agricultural engineers and technicians.*

the User (Mir and Quadri, 2009: 378). The process of making decisions begins with building databases to produce historical data on the relevant topic (in agricultural, this includes information about pests, weather, humidity, and other factors). Access to, and management of, historical data are handled by the Database Management Subsystem. Knowledge-based management primarily uses the "what if" approach to provide structure and aid in the solution of unstructured challenges. For instance, in agriculture, "pesticide in such concentration is applicable if rainfall is greater than 200 mm and relative humidity is 80%." (Mir and Quadri, 2009: 380). User Interface Subsystem is part where user interacts with DSS system. It consists of input-output choice, data presentation, reports of historical data and screen design (a.g.e: 381). User are the individuals who monitor the data and interact with the system. To design a successful DSS application, end-user expectations need to be covered (Cox, 1996; McCown, 2002).

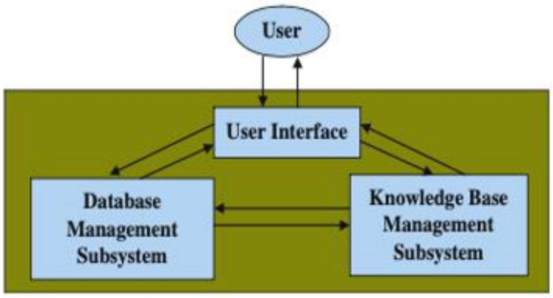


Figure 2-1: The architectural components of a typical DSS
Reference: (Mir and Quadri, 2009, 1970: 378)

In the second half of 1990s, with the specification of HTML 2.0, the modern era in decision support systems started (Ecom, 2002). Rapidly processing huge data sets can be stored to back-end. The use of big data revolutionized DSS and lead it to be integrated with mobile communication and improved software. Turban et al. (2005:134) listed today's set of capabilities of DSS as follows:

- Multiple, remote users can collaborate in real-time using rich media.
- Users can access DSS applications anywhere and anytime.
- Users have fast access to historical data stored in very large data sets.
- Users can view data and results visually with excellent graphs and charts.
- Users can receive real-time data when needed.

AgriDSS is defined as a system that aims to help farmers to make sustainable decisions (Bakker-Dhaliwal et.al., 2001). As agricultural production is highly affected by climate changes while it contributes to it, each decision that the farmer makes, affect sustainability. Generating a more sustainable agriculture is one of the important study fields of DSS (Van Meesel et.al, 2012). According to AgriDSS approach, in the core of changing towards sustainable agriculture, there is the decision maker that operates the system. AgriDSS includes a set of applications. For example, a decision support application might present and compare weather forecasting between one week and next. It can project yield of particular crop before harvest. It can predict the pathogen infestation based on the climatic conditions. Today, AgriDSSs are widely used and known in agriculture (McCrown,2005). Yet, unfortunately because of deficiencies in ease of use, users are unlikely to discover the capabilities of the system. There are many studies that focus on usability of AgriDSS. First of all, Knight and Mumford (1994) indicated that to create usefulness of AgriDSS farmers as end-users need to be involved in before and after development stages. They also indicate that low use and adoption, complexity, user inputs, distrust for the output, lack of field testing are some issues that needs to be addressed. According to their research, AgriDSS technology have flaws to improve farmers' practice (Leeuwis, 2004). Firstly, the design and presentation of data is so complex that one cannot operate it efficiently without requiring considerable technical support. They emphasized that system has unrealistic expectations from farmers. Cox et.al (2005) also made research about user's preferences in AgriDSS. They found that addressing this system needs to be approached from farmer's point of view. Even technology developers claim that it is very simple to use, the farmer's point of view might be different and might be unlikely to use it. In this study they claimed that farmers won't use AgriDSS if the user interface doesn't use their terminology no matter what its capabilities. They indicate that the user interface of AgriDSS needs to be consistent, simple, adaptable and flexible. Furthermore, Jorgensen et al. (2006) highlights the importance of information presentation on user interfaces of AgriDSS. They indicated that it does not match with the farmers need due to its unpractical usability. They indicated that farmers have different modes of knowledge, which they employ at the moment of decision. They divide farmers into three groups as systems-oriented, experience-based and advisory-oriented. The varied knowledge orientation leads different ways of using DSS. They stated that poor understanding of how agricultural DSS is actually used is one of the main barriers for user satisfaction. Van Meensel et al. (2012) mentioned the gap between science and practice within agriculture. They pointed out that uptake of AgriDSS has been poor as it is too complex, terminology and functions are irrelevant for the intended users and their activities. Lindblom and et al. (2017) indicated that user-centered design (UCD) approach might answer the identified problems of most AgriDSSs, as it uncovers the farmers' real expectations and involve them early and continuously in the design process. They emphasized that sustainable agriculture might be possible when farmers are able use AgriDSS sustainably. According to this study, sustainability should be governing principle of agricultural decision systems design which can only be ensured with an usable interface design. They emphasized the importance of HCI framework to create user-centered DSS designs. Lindblom and et al. (2017) also indicated that it is surprising there is very few ethnographic empirical studies of how using DSS is integrated in naturalistic decision-making process of farmers. This study proposes that conducting long-term case studies using ethnography would be a more appropriate method to examine the intricate decision-making processes of farmers in agriculture and the use of Decision Support Systems (DSS). Researchers stated that it is important to better understand how farmers experience the use of AgriDSS and how it affects farmers' complex decision-making processes. In Turkey, with the increase use of ICT, agricultural support systems started to become more familiar.

2.2. AgriDSS in Turkey: The use of digital climate stations

Today farmers have been under the extension of many challenging factor to continue their agricultural production. They might be confused while considering so much variable together and need a voice. Agriculture decision support tools help farmers to make data driven decisions by analyzing large amounts of data such as field mapping, analyzing soil moisture, leaf wetness, tractor guidance and so on. Internet-accessible AgriDSS tools help farmers monitor multiple assets at once by letting them to access real-time data via their computers or smartphones (Wolfert et al., 2017). Farmers are enabled to utilize real-time data by the help of sensors that are placed plants, animals, soil and water. Because they are able to predict the nature events, they can manage risks in agricultural production. Today, more AgriDSS applications have been developing to help farmers to make decision about reducing expenses, gaining higher yields and creating a more environmental-friendly farms (Eastwood et al.,2017). The mobile applications that are designed based on AgriDSS technology are called "on-farm applications."

Since 2016, various companies in Turkey have been introducing different on-farm applications. First of all, in 2016, Toros Tarım company developed an agricultural decision support about fertilization application called “Toros Çiftçi” that is free access for any farmer via their phones or tablets. By using this application, the farmer can receive field-specific fertilization and meteorologically recommendations. Farmers through using this app might have chance to decide the most appropriate action related with fertilization at the most appropriate time. Moreover, TürkTraktör launched “Tarlam Cepte” application, which provide digital decision supports to farmers in agricultural activities. By using this application, farmers might benefit from information services about the market prices of fertilizer, diesel, pesticides. Farmers also receive announcements against weather risks. It also serves satellite-supported remote tracking for products and fields. Although it is free for only TürkTraktör clients, application can also be purchased from GooglePlay and Appstore. Furthermore, Doktar is a corporation specializing in agricultural technology that seeks to enhance the food ecosystem through the strategic utilization of information and data-driven decision-making. It develops digital agriculture solutions for farmers based on analyzing agricultural big-data. Furthermore, the application of “tarla.io” provides weather-soil-plant related agricultural intelligence for farmers to help in decision-making process generally in field crop agriculture. This service measures hyper local weather information, and collects data about soil parameters. By processing big data for various needs, tarla.io provides information for risk mitigation and adaptation. By providing data-based insights to farmers it helps to execute appropriate decisions under the challenges of climate change. It is free for farmers that have less amount than one acre of land. In my field research in Adana, I also came cross with a brand-new application called “Topraq”. It is also a decision support application that heavily focus on irrigation management. The distinctive feature of this service is that farmers may hire it rather than purchasing. The aim of the company is to be affordable for every type of farmers and generate its agricultural big data fast.

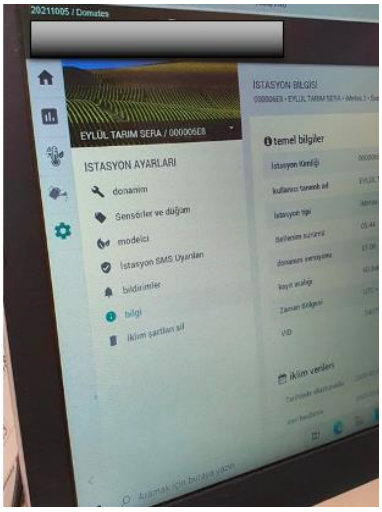
One of the most commonly used digital farming technology in Turkey is digital climate stations. By using data collected from range of wireless solar powered sensors, digital climate stations provide real-time data to farmers about farming conditions. Digital climate stations are developed to manage variable climate changes. These stations collect, record, process, presents data on agricultural production that is highly affected by environmental conditions[2]. By using these stations farmers, advisors

[2] Retrieved from user manuals of the related company.

become able to monitor growing conditions and schedule farm work routines. Digital climate stations support farmers monitor real-time data related with weather conditions from a variety of sensors to farmers including: relative humidity, leaf wetness, temperature, precipitation, solar radiation, soil moisture and wind speed and direction.

Photograph 2-1/ 2-2: Climate Station

Digital climate stations capture localized forecasts data and regularly upload to its software so that farmers get real-time information wherever they are. Farmers can benefit from decision support tools including weather forecasts, spray forecasts, disease models, and irrigation management in addition to historical data access. It measures, logs and sends data to the cloud. Early warning messages can be triggered per SMS. The users are able to enter the system through web page and mobile application.



Photograph 2-3/2-4: Web page and mobile application

Digital climate stations are expected to support farmers decision by giving them extreme local weather forecasting. To illustrate, since farmers are able to know in exactly which time period they need to fertilize, the loss of fertilizer due to sudden rains doesn’t occur. Moreover, since farmer are able to know in which hour the frost and freeze will take place, they might generate certain kinds of solutions to prevent the products from frost and freeze damages. Hence it helps farmers to manage financial risks and take more environment friendly act.

When I first learned the functions of automatic climate stations, I wondered how the need to use an automatic climate station arouse as Turkish State Meteorological Service has been working commissioned with producing the meteorological and climatic data pertaining to Turkey since 1937 (Deniz et.al,2012). I learned that the radars of Meteorological Service stations have the coverage area with a radius of 200 km. But the climate of a land with 200 km radius is not homogeneous. As the distance of a farmer from the station increases, the accuracy of the data s/he receives decreases. Moreover, weather stations need to be established away from buildings since the heat strokes from buildings can deflect radar measurement. However, with unplanned urbanizations, the weather stations of Turkish State Meteorological Service which were established away from city centers at the beginning become eventually located in the city centers. Therefore, the deviation ratio of the Governmental Meteorological Service has increased. In a period as climate change threats agricultural production, it is very difficult for farmers to compensate for the margins of any deviation. Digital climate stations are developed AgriDSS to help farmers to extremely local weather forecasting, sensors automatically read every 12 minutes with 5 km radius. All data can be stored and downloaded in excel format. Therefore, farmers can make decisions based on real-time data or they can analyze the history of data and compare the impacts of earlier decisions.

There are three different uses of digital climate stations in Turkey. Firstly, companies purchase these stations for their employees to use and use big data-driven information in decision support mechanisms in production planning. Secondly, non-governmental organizations purchase these stations in cooperation with private companies, analyze the data and send it to their members. Thirdly, the Ministry of Agriculture grants these stations to regions with high agricultural production volume, and the data processed by provincial and district agricultural directorates are delivered to farmers registered in the system as early warning messages.

This study focus on the third way in which state grants the stations and deliver early warning messages to farmers. In doing so, it does not regard digital agriculture as a set of technical possibilities that assist farmers in their decision-making processes, nor does it evaluate technological growth through instrumental rationality. I argue that the communication of agricultural knowledge is not only about creating linkages between actors on the contrary, the socialization of agricultural information and knowledge requires an inclusive analysis of the interplay between technology and society. Consequently, the delivery of data based-information and digital technologies brings social, technical and political questions. Revealing the mutual ties between technology and society rather than focusing technological possibilities offered by climate stations help us to understand how farmers make sense about climate data provided, to what extend their decision are determined by its utilization and to what extend it underpins sustainability in the region. Therefore, this study investigates digital agriculture by considering the interplay between technology and society. It examines the social references of digital agriculture relying on Science and Technology Studies. Therefore, based on the co-production framework of STS work, I examine the social references of agricultural information and knowledge system in which digital agricultural technology is attempted to be integrated into socialization of agricultural knowledge and question to what extend it contributes sustainability in agricultural production.

3. CONSTRUCTION OF CRITICAL THINKING TOWARDS DIGITAL AGRICULTURE WITHIN SCIENCE AND TECHNOLOGY STUDIES

"A lady came up to great violinist Fritz Kreisler after the concert and gushed *Maestro your violin*[3] *makes such beautiful music.* Kreisler raised his violin up to his ear and said *I don't hear music coming out of it.*" Melvin Kranzberg (1986), one of the most influential historians of technology tells this anecdote to identify technology not simply with technical elements but with human affairs. He indicates that deterministic interpretations of technology reveal a bias that it has an autonomous, internal technical logic. Debates over technological determinism resonate with the lady's voice in Kreisler's parable gushing that violin makes such beautiful music.

Prior to the 1970s, technological determinism was the most influential theory and the definition of technology is associated with "development" and "rationalization". It is regarded as an independent factor of its historical and social context (Kline, 2001). According to scholars who hold this perspective, they perceive technology advancement as a driving and influential force that significantly shapes society (Winner,1977; Wyatt, 2008; Dafoe, 2015). To illustrate, by asserting technology is the most important cause of change in society, Ogburn and Nimkoff (1964) prepare a list of 150 suggestion about social effects of radio in United States. Technological determinists tend to think of technological change in terms of cause and effect and of means and ends. The causality is formulated simple as science shapes technology and technology shapes society.

With the emergence of critical turn in social sciences, positivist paradigm that regards technology as an outcome of applied sciences rationality started to be questioned in the field of STS. Critical theory of technology has emerged as a critique of positivism and determinism (Feenberg,2015). Scholars analyzing the effects of technological development on society have discredited the tenets of the deterministic

[3] In this anecdote, Kreisler accepts the violin as a symbol of technology to indicate its defination as the application of scientific knowledge for practical purposes.

causality and asked what has shaped the technology that is having "effects"? (MacKanzie and Wajcman, 1999). Such a shift of focus, rejects accepting technological change as a given, independent factor and society as a passive receiver. As the critical theory of technology has made great strides, technological determinism has been reduced the status of a straw position[4] (Lynch, 2008). Critical theory argues that the notions of "producing scientific knowledge", "instrumental rationality" and "technological development" are strongly attached their historical, social, political contexts. Feenberg (2015) claims that critical theory of technology highlights that technology is produced as a result of complex social actions and politics. He indicates that technology carry both the marks of its social production and its capacity to reproduce the social and political values of the society that created it. Likewise, Kranzberg (1986: 546-548) indicates technology is neither good nor bad; nor is it neutral. For him, technology is the result of a complex process of negotiation in which a variety of social actors and institutions are involved. Sterne (2003:8) also agrees with Feenberg and Kranzberg by saying the words such as "digital", "technology", "new technologies" are not neutral categories in themselves. They are indeed historically specific instances resulting from a wide range of political, economic and social circumstances.

3.1. The Co-productivist framework of STS

The sociological relevance towards the study of technology insofar was to evaluate its scientific rationality on the societal patterns (Ogburn 1922; Gouldner and Peterson 1962) until the critical turn in STS (Disco, 2005). Offering a new reflexive understanding, new social studies of technology in STS express the idiom of co-production. Within this idiom, STS has become an interdisciplinary field that interrogates not only how science and technology shape the society but also how the latter in turn shape technological developments (Felt et.al., 2017). This reflexivity opens up science and technology to critical assessments. According to Brooks (1999) STS asks the question "to what extent technological development is autonomous in respect to societal development and to what extent do societal factors direct technology

[4] To read a more compherensive discussion about social constricution of technology and technological determinism please see Bijker, W. E., Hughes, T. P., & Pinch, T. (1987). The Social construction of technological systems: New directions in the sociology and history of technology. Cambridge, Mass: MIT Press. and Dafoe A. (2015). On Technological Determinism: A Typology, Scope Conditions, and a Mechanism. Science, Technology, & Human Values. 40(6):1047-1076. doi:10.1177/0162243915579283

and its applications." It emphasizes that people construct and perform science and technology and in the process of making them they also reproduce themselves, their bodies, identities, societies and material surroundings. In other words, co-productivist framework of STS focus on unravelling the interactions and mutual constitution of science, technology and society (Sismondo,2008:14-15).

Patterns of co-production are contextually mediated in terms of different origins, historical dynamics of socio-technical relations. There are certain leading questions engendered in the idea co-production such as "how and under which social conditions science and technology are produced; what we are doing with scientific knowledge and technological artifacts and also what science and technology are doing with us." (Harbers, 2005:15). Moreover, in the co-productionist framework science is not a simple reflection of naturalistic truth free from social and political interest. More specifically scientific knowledge both embeds and is embedded in social identities, institutions, political power, representations and discourses (Jasanoff,2004). In this regard, this scholarship focuses on the production, distribution, and consumption of scientific knowledge and how it shapes and is shaped by different social, political and economic factors. Accordingly, by raising such questions, the universal principles of technoscientific development such as rationality, neutrality, efficiency are partially replaced by empirical, historical, social and political contexts of the technology (Harbers, 2005: 13).

Acknowledging science and technology and society are mutually dependent and internally related, STS scholars concern about orienting studies to contemporary social, ethical and environmental problems. They aim to engage all stakeholders such as activists, scientists, decision makers, designers, engineers and other related areas on matters of equity, policy, politics, social change, national development, and economic transformation. Scholars aim to develop a scholarship that search how societies make science and technology in ways that improve outcomes for people and the planet by discussing complex and diverse social, cultural, and political interactions that are evident via the use of technology. (Hackett et.al, 2008). Especially with the increasing public awareness of environmental crisis, studies have been conducted in STS that reveal a profound understanding of sustainable development and environmental policies that are historically shaped by political, socioeconomic forces. Yager (2013) argues that STS approach more recently expanded to STES where "E" stands for environment. STES as a new emerging field represents a paradigm in conceptualization of scientific knowledge and technology particularly concerning sustainability (Zoller,2011). Today, the challenge of converting present socio-technical system into a sustainable system are conventionally assumed to be a “technical” problem (Stirling, 2006). In this respect digital agriculture is positioned as expected “technical fix” to shift farming systems to sustainable production. Yet, Pauwels (2011) argues that the meaning and the implications of sustainability are partly human construction. Whether it is called STS or STES, the approaches towards sustainability require understanding the dynamics of between human action, production of knowledge and environmental change (Wynne, 2007; Zoller,2013).

In the co-productionist framework of STS which argues science, technology and society are mutually co-produced (Beck, 1992), Foucauldian power/knowledge understanding is one of the approaches that are most utilized to conduct analysis. It creates rooms to diminish dualities within the determining power of technology and the constructed power of society. In a Foucauldian perspective, it refuses the duality in power relations between rules and the ruled. It rather focusing on manifold relationships of forces (technology-society) as power is always accompanied by resistance (Foucault,1998). Hence, by thinking together power/knowledge concept and co-productionist framework of STS I argue that, transferring scientific knowledge and technology in terms of particular economic and political interest does not necessarily determine how it is executed by farmers. Against the risk of claiming economic and political structure directly shapes power/knowledge mechanism up to bottom, the historico-critical analysis in the previous chapter that is related with producing scientific knowledge and its extension in agriculture needs to be expanded by focusing how power of scientific knowledge and technology is negotiated and executed by farmers. Thus, I interrogate how particular agencies[5] of farmers and agricultural engineers respond receiving scientific knowledge and adopting new technologies in agriculture. I aim to reveal the mutual constitution of science, technology and society respectively by understanding how power/knowledge are exercised in the course of agricultural extension, which tactics farmers developed due to evaluate the credibility of scientific knowledge. Also, I consider how digital agriculture affects the socialization of agricultural knowledge and how it integrates into power/knowledge.

[5] I use the definition of agency developed by Tschötschel and Jacobs (2021) as patterns of human meaning-making, capacity to construction, interpretation, making decision.

Sterne expresses that since with the advent of computers in 1950, non-stop march of digitalization makes the word of “digital” as a modifier to the word of “technology”. He notes that the category of “technology” itself collapse into the word “digital”. If so, how do we apply the lenses of critical theory to the word “digital”? How do we conceptualize the word “digital” in political, economic and social context? Johnson et al. (2017) point out that the key word for understanding digitalization is *Big Data.*

The concept of big data and its treatments

Johnson et al. (2017) define digitalization as a developed capacity to transfer, storage and processing of Big Data flow in a way that can be understood by computers by means of digital information technologies. From an epistemological perspective, knowledge is composed of several information strands, whereas information is composed of a collection of data (Anderson, 2008). According to De Mauro et al. (2016), big data is a term used to describe information assets that are large in volume, velocity, and diversity and that need particular technologies and analytical techniques in order to be transformed into value. Kitchin (2013:262) details that Big Data is different from information gathering as follows:

> … huge in volume consisting of petabytes of data; high in velocity, being created in real time; diverse in variety, being structured or unstructured; exhaustive in scope, striving to capture entire populations or systems, being fine-grained in resolution and uniquely indexical in identification; being flexible, holding the traits of extensionality, being scalable and expandable in size rapidly.

Gitelman (2013) claims that big data promises a level of accuracy in information processing, storing, and analysis that was previously unattainable because of technological constraints. asserts that Big Data promise a level of precision, information storage, processing and analyzing that was previously impossible due to technological limitations. Today, data collection is a constant activity, data storage and transmission capacity measured with petabytes. Anderson (2008) points out the importance of the word “petabyte” as follows:

> The petabyte is different because more is different. Kilobytes were stored on floppy disks. Megabytes were stored on hard disks. Terabytes were stored in disk arrays. Petabytes are stored in the cloud. Sixty years ago, digital computers made information readable. Twenty years ago, the Internet made it reachable. Ten years ago, the first search engine crawlers made it a single database. Now Google and like-minded companies are sifting through the most measured age in history, treating this massive corpus as a laboratory of the human condition.

The proliferation of the vast amount of data and its promising analytical potential recalls the epistemological framework of positivist lines that conceptualize Big Data as an ultimate force that profoundly shapes society. Cukier (2010) points out that researchers who prefer to treat Big Data in positivist framework consider that the world contains an unimaginably vast amount of data and this data deluge offers a whole new way of unfolding the world. Also, Anderson (2010) agrees with Cukier by indicating that throwing raw data into the biggest computing clusters allow us to see statistical algorithms which help us to find patterns where science ever cannot accomplish before. In 2010, The Economist published a special report entitled “Data, Data Everywhere.” This report expresses that the amount of data increases tenfold every five years. According to the report, properly managed data may be used to hold governments accountable, open up new sources of economic value, and offer novel scientific insights. The report claims that Big Data makes it possible to do many things that previously could not be done because algorithms help us to prevent real time and near future patterns. Likewise in technological determinism, positivistic approaches towards Big Data promote new inventive data science techniques as independent forces that shape society. For instance, Morze and Strutynska (2021) assert that digital records enhance care quality, simplify the lives of physicians, and lower costs for both patients and providers. Big Data, they claimed, may also be used to detect unintended drug interactions, determine the best courses of action, and anticipate the development of illness before symptoms appear. Scholars that advocate Big Data bring huge benefits to society claims that today’s algorithms and computers increase the productivity and improve human welfare ((Boyd and Crawford, 2012; Dodge and Kitchin, 2005).

Dalton and Thatcher (2014) emphasize that Big Data might be regarded as a useful tool that help us to collect and process massive quantities of data that is produced by and about people, things, and their interactions. On the other hand, they said this definition narrowly takes the “Big Data” itself. However, Big Data is never a neutral. It is shaped by a set of contested political, social and economic factors. Big Data cannot be viewed as a technological achievement isolated from its social, historical, and political contexts, according to critical social scientists (Boyd and Crowford, 2012; Burns and Bush, 2014; Couldry and Turow, 2014; Crawford et al., 2014). According to Boyd and Crowford (2012), there is a need to critically examine "what all this petabyte data means, who gets access to what data, how data analysis is deployed, and to what ends." Likewise, Pushmann and Burgess (2014) state that Big Data remains a metaphor that is a set of practices, a critical ethos needs to be developed to problematize inherent assumptions of data as a “fact”. As noted by Illiadis and Russo (2016), critical approach of Big Data does not contribute to knowledge in positivistic sense but instead analyzes the ground upon which positivistic Big Data science stands. According to them, one way of addressing a critical question towards Big Data might be formulated as: “How do Big Data inflect and interact with society, social processes, and how we come to measure and interact with them? Dalton et al. (2016) argue that the amorphous groups of individuals, texts, projects, and institutions that seek a specific and pronounced critical engagement with Big Data needed a name to use. Voices that have raised the call for a systemic approach to Big Data criticisms result in the emergence of the field called “Critical Data Studies” (Dalton and Thatcher, 2014; Kitchin and Lauriault, 2014).

The dimensions of critical data studies

The nascent field of CDS interrogates all forms of potentially depoliticized data science by analyzing ways in which data are generated, curated, and how they permeate and exert power on all manner of forms of life (Illiadis and Russo, 2016). Scholars have attempted to draws the critical theory of technology towards the study of data for a deeper understanding the relationship between Big Data and society. Rather than treating Big Data as neutral phenomena, CDS scholars advocates that data are never raw but always “cooked” (Gitelman, 2013). They claim that raw data and numbers don’t speak for themselves (Gillespie, 2014; Yousif, 2015; Kramer et al., 2016). CDS scholars (Bowker et al.2010; Gitelman, 2013) highlight the context of the production and use of Big Data as it is actively framed and interpreted by people in particular social and technical contexts. As Manovich (2001:224) states “data don’t just exist but they have to be generated”.

Kitchin and Lauriault (2014) argue that CDS prompts inquiries into the fundamental features of data, including their generation, organization, analysis, and utilization. To answer those questions CDS explore technological, political, social and economic contexts that constitutes and frames the generation, circulation and deployment of data. A solid body of work in CDS is revealed by approaching Big Data from critical perspectives such as Big Data surveillance, data power structures, dataveillance (Clarke,1998; Lyon, 2003) the ethical and social ramifications of unauthorized collection and selling of user data (Matlack, 2012; Felt, 2016) how much crowd-sourced information is benefiting marketers (Qualman, 2009) and other economic, political, cultural issues around it (Crawford, 2014; Kitchin, 2014; Levy, 2019).

The multidimensional critiques of Big Data have been growing out. With the publishment special theme of Big Data & Society journal, CDS offers a welcome for the critical investigations of different data intensive fields that remained in the periphery in social sciences. With a renewed attention towards CDS, many issues and subjects related with Big Data are exposed to be analyzed in political, social and historical contexts. In other words, with the publishment of special edition of Big Data & Society journal, CDS made a call to further attend to critical data problems in multiple data science domains, from health systems to environmental problem, from financial regulation data use food and agricultural technology.

From periphery to center: Critical data studies call for digital agriculture, farm data researches

Bronson and Knezevic (2016) indicates that the topic of Big Data in food and agriculture seems a research priority because producing food is expected to be one of the most significant challenges of the world under increasing environmental problems. One of the proposed solutions to overcome this challenge is “digital agriculture” (Fraser, 2019). This term is broadly defined as application Big Data to agricultural production (Rotz, 2019). Some proposed that collecting and analyzing on-farm Big Data help farmers to produce more food by using less land and fewer inputs (Frank, 2014). Emerging technologies such as yield monitors and maps, remote sensing, variable rate application, robotic milking machines, digital farm management and decision-support software are expected to customize farmer’s practices to save their time and money. With that being said, Rotz et al. (2019) note that there is a lack of scholarship based on critical theory of technology and critical data studies which analyze production of digital agricultural technologies in its social context. The uses of Big Data in the realm of food and agriculture have been analyzed under productivist model along with the discourses of rationally managed, technology-maximizing, profit-oriented businesses. Discussions around digital agriculture remained highly technocentric and thus the main focus is analyzing benefits of ag-tech advancement. Studies explore the rise of digital agricultural technology has typically focused on the scientific or economic dimension of Big Data and how it offers particular solutions for farmers to feed growing population under a challenging agricultural ecosystem. Scholars (Bronson and Sengers, 2002; Belaud and Prioux, 2019) indicate that there is lack of scholarships about how on-farm Big Data is generated, what kind power relations emerge within the on-farm data ownership and development and what kind of social relations that data-driven farming entails. Scholars emphasize that under the pressing environmental conditions, producing food become a challenging issue. As a proposed solution, digital agricultural technologies, data-driven farming practices have been expanding. They indicate that voices of Critical Data Studies need to raised.

The paper entitled "The Politics of Digital Agricultural Technologies" takes a thorough and critical approach to the utilization of Big Data in the field of agriculture. In this paper, Rotz et al. (2016) aim to provide a thorough analysis of the political economics surrounding the digitalization of agriculture. According to Rotz et al., historical as well as current policies have influenced the political and economic circumstances in which all technologies, including digital agriculture, develop. They provide a brief summary of how political economics can serve as a useful framework for comprehending significant obstacles in controlling technologies and data systems in agriculture. This is achieved by raising inquiries regarding data ownership and control, developing of technologies and data advancement, and data security. This study also examines the potential of digital technology to especially enhance agroecological systems. Researchers highlight that while there are inherent conflicts between agricultural technology and agroecological techniques, they can exist together without being mutually exclusive. The paper examines the potential of Big Data technology to assist not only large-scale farmers, but also agroecological and small-scale farmers, and explores the extent to which this support may be provided under various circumstances. Findings indicate that farmers have limited control over and ownership of their data, resulting in limited power over consent rights. Digital agriculture firms claim that "farmers own their data," but what exactly that ownership entails is unclear, leading to a persistent lack of informed consent. Furthermore, experts have stated that corporate interests drive the development of digital agriculture technology in the manufacturing of technologies and data. Therefore, the article describes the technical advancement as 'top-down', contrasting it with 'bottom-up' or 'farmer-driven' development. Technological advancements are made and data is gathered from sources other than farmer networks, resulting in a decreased likelihood of being influenced by farmers' demands. Consequently, several farmers, particularly those practicing agroecology, contend that the technologies that are being advocated to them are inadequate in successfully and properly addressing the on-farm challenges they encounter. They stated that it is the outcome of how technology are produced to serve specific goals. The article highlights that publicly financed open-source platforms for data exchange appear to be highly beneficial in facilitating digitalization for agroecological and small-scale farmers. The paper highlights the emerging difficulty of data privacy and security as database technology quickly advances. Additionally, there has been a lack of focus on digital agriculture. Researchers suggest that the conceptualization of risk management and stakeholder involvement should be applied to digital agricultural technologies. They contend that food systems are more susceptible to both unintentional and intentional cyber assaults. Overall, the piece frequently highlights the increasing worry around data rights for farmers. The digitalization of agriculture should be implemented in a decentralized manner, tailored to local conditions, and led by farmers themselves. This approach should prioritize the requirements of farmers and involve the use of open data and data sharing to ensure fairness in the use of agricultural data. The aim is to promote and support local farmers who practice agroecology. Otherwise, these technologies will continue to be accessible only to those with financial means, hence perpetuating the socioeconomic disparities in agricultural sectors.

As stated above, Rotz el.al (2016) conduct a comprehensive study by applying a political economy lens to understand digital agriculture by the means of power and technology within three main category such as *data ownership and control*, *the production of technologies and data development*, and *data security*. On the other hand, although they indicate the digitalization of farming is the most significant change to emerge in the food system since the Green Revolution of the 1950s and 1960s, they didn’t conduct a critical historical analysis. The article emphasized that political and economic forces of industrialization have been central to the development and expansion of on digital agriculture, researchers didn’t enter into details. On the other hand, Critical Data Studies allow us to make sociologically informed history of on-farm Big Data. Beer (2016) proposes that *The Foucault Effect* needs to be revisited and Big Data needs to be placed within the methodology *genealogy*[6]. Beer argues that

[6] Genealogy is, for Foucault, a method of writing critical history: a way of using historical materials to bring about a “revaluing of values” in the present day (Garland, 2016).

we have little understanding of the Big Data as a concept itself, where it came from, how it is used, what it is used for, how it lends authority, validates, justifies, and makes promises. In other words, according to Beer, works through a detailed historical account of what might be thought of as the sociological birth of Big Data needs to be conducted. Beer argues that it is this concept that needs to be tracked, unpacked and examined. As Hacking (1990) argues, only way to really understand the power and influence of concepts is to see them in their historical context. They both imply that we can only understand certain social phenomena through their discursive and conceptual formulations by thinking historically about them. In other words, we need to explore the relationship between concepts in their historical site because concepts are a product of their historical origins. The organization of concepts are at the heart of social transformations (Hacking, 1990: 189). Beer claims that it is the Foucault effect. He describes Foucault's approach as examining what is presently required, through specific case studies is a much more detailed mapping out and deconstruction of the unfolding a social phenomenon. He asserts that genealogy of digital agriculture allows us to achieve a detailed exploration of the trajectory and influence of the concept of Big Data. From the inspiration I took from Beer's article, I claim that treating Big Data integration in agricultural practices is a specific case study and making its genealogy help me to historically understand social and political transformations of Turkey's agro-food landscape. Contextualizing digital agriculture as a historical result of particular socioeconomic and political transformations is possible by applying Foucault's method of writing a "history of present". This method can also be regarded as genealogy of digital agriculture. Firstly, I need to explain Foucault's genealogical method and reveal the differences writing history of present from conventional historiography. Then, I attempt to conduct a genealogical inquiry towards digital agriculture and writings its history of present.

3.2. Foucault's genealogical method and writing ''History of the present''

In the "Discipline and Punish", Foucault (1977) put the idea of using history as a means of critical engagement with the present. To do this, he developed genealogical methodology and "history of present" approach. The reader firstly encounters with 'history of the present in "Discipline and Punish" as follows:

> Why write a history of the prison? Simply because I am interested in the past? No, if one means by that writing a history of the past in terms of the present. Yes, if one means writing the history of the present (Foucault, 1977a: 31).

Garland (2014) states that the phrase of ‘‘history of the present’’ sounds paradoxical at first. Scholars might think that it suggests “presentism”[7] and thus suppose such an approach entails the fundamental error of anachronism. Presentism guide scholars to project contemporary values and meanings onto a past. In other words, it means reading present social and cultural arrangements back into history with the same significance and character they have today. As Dreyfus and Rabinow (1982: 119) emphasize writing the history of the present is another matter. Garland (2014) points out that writing history of present begins with a diagnosis of the current situation. As Foucault (1984: 178) explains he begins with a question posed in the present and sets out from a problem expressed in terms of current today. He said that he tries to mapping out the question. Writing a history of present is not a work finding historical origins of a social phenomenon; it differs from writing conventional history. It rather is a method of writing critical history, a way of using historical materials to revalue of the current values that are accepted as given at the present. It is a critical engagement with the present, a critique of the present time based upon retrospective analyses. Writing history of present need a genealogical inquiry that traces how contemporary practices and institutions emerged out of specific struggles, conflicts, alliances, and exercises of power, many of which are nowadays forgotten. As Foucault (1984:89) states genealogy is a not a search for connecting the present day to its origins but tracing discontinuous process whereby the past become present. Also, Dean (1994) describes genealogy as an ‘effective history’ because its intent is to problematize the present by revealing the power relations upon which it depends and the contingent processes that have brought it into existence. Foucault (1991) indicates that the present-day has been shaped by complex power relations and struggles. Genealogy is not conducted by historical concerns to understand the past. It seeks to trace the struggles, displacements and showing how contemporary practices emerged how historical conditions of existence upon which present- day practices depend. As Garland (2014) states that by reconnecting contemporary practices with historical struggles and exercises of power that shaped their character, the genealogist prompts us to think more critically about the value and meaning of these phenomena.

To illustrate history of present, an example can be drawn from Foucault’s treatment of Jeremy Bentham’s Panopticon. Here, Foucault’s aim is not to understand

[7] an attitude toward understanding past using the concepts and concerns of the present.

historical origins of punishment. He demonstrates the role of Panopticon shaping our present. For Foucault, the principles of observation, visibility, discipline, power and knowledge contained in Bentham's design provide an intelligibility for understanding how power operates in our own present-day society. He is engaged in the historicocritical analysis of power struggles and modes of control that are hidden in the word of Panopticon and their continuing operation today. Moreover, in the "The Birth of the Clinic: An Archaeology of Medical Perception", he remarks the historical establishment and formation of medical gaze by uncovering the strata of medical norms and the authority of expert knowledge. By developing the concept of medical gaze Foucault indicates that doctors modify the patient's story into biological paradigm, approaching patients as a series of disconnected parts instead of a whole. Through medical gaze, humans are reordered by cases and are tied to medical practices such as diagnosis and treatment. Hereby, medical gaze is established by objectification of scientific statements, power of empirical scientific knowledge and discipline. By focusing on the relationship between doctor-patient. Foucault attempts to reveal historicocritical analysis power/knowledge in case of medicine.

Garland (2014) states that for conducting a proper genealogy, scholars need to understand how Foucault identify the present, how he poses the questions and how he addresses them. Garland points out that writing history of present with a genealogical inquiry needs preliminary work of *diagnosis* and *problematization*. Firstly, Foucault's genealogy starts with diagnosing by defining ''the present'' of a social phenomenon which it is to be a history in our relation to mechanisms of power–knowledge. After that genealogy continues with problematization of the phenomenon how it become a kind of problem for specific authorities at a specific point in time. To do this, Foucault coined the term dispositif. Dispositif is the formation of an apparatus[8] which has a major function at a given historical moment that of responding to an urgent need. The apparatus that is consisted power- knowledge struggles which has a dominant strategic function in a given historical moment. Dispositif is a key term for Foucault's genealogical methodology. To understand it clearly, I need to explain how Foucault conceptualizes power and knowledge.

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[8] Some studies make distinctions between dispositif and apparatus. Yet Garland (2014) and Krizman (1988) accepts dispositif as formation, the sum of of the apparatus.

According to Foucault (1991), power is constituted through accepted forms of knowledge, scientific understanding and 'truth'. He emphasizes that each society has its regime of truth, general politics of truth, types of discourses that accepts and makes function as truth. He indicates that there are techniques, procedures that accord particular values in the acquisition of truth by those who are in charge with saying what counts as true. According to him, regimes of truth are the result of scientific discourse and institutions and constantly redefined through education system, media, political and economic ideologies. He indicates that power is deployed in terms of battle of truth. The battle is made by certain political and economic ideologies about not directly discover an absolute truth, it is about the defining rules that determine and separate which the true or false and particular effects of power are attached to the true. In other words, he emphasizes that knowledge is produced by regimes of truth within the power relations of ideologies. He seeks out to reveal how regimes of truth are created and utilized by different organizations of power, consisting of sets of articulated institutions. He interrogates how power- knowledge regimes actually operate in society. As a response to this question, he speaks out "apparatuses" that is to say institutions with power. Foucault indicates that truth and knowledge is produced and transmitted under the control of dominant political and economic apparatuses. These apparatuses privilege the production of disseminate some information over another. He also points out that battle of truth is historical as political and power relations of ideologies and apparatuses are constantly redefined. The formation of the apparatuses includes institutional, physical, and administrative mechanisms and knowledge structures that maintain the exercise of power within the society. The elements of the apparatus conceptualized as dispositifs. These elements help us to problematize a given present social phenomenon which it is to be a history by mapping out critically in terms of power–knowledge mechanisms. Foucault (1980: 194) describes the term as follows:

> What I'm trying to pick out with this term [dispositif] is a thoroughly heterogeneous ensemble consisting of discourses, institutions, architectural forms, regulatory decisions, laws, administrative measures, scientific statements, philosophical, moral and philanthropic propositions – in short, the said as much as the unsaid. Such are the elements of the apparatus. The apparatus itself is the system of relations that can be established between these elements.

All in all, Garland (2014) indicates that scholars that intend to write history of present within a genealogical inquiry, firstly need to diagnosis of the current situation. After that they need to begin analysis from questions posed in the present. To do this, they need to problematize the current situation in terms of power- knowledge struggles. They need to ask how a specific phenomenon came to be regarded as a specific kind of problem for specific authorities at a specific point in time. They need to examine what is called an urgent need today and what kind of responses are privileged to meet the urgent need. Utilizing dispositif requires problematization of the current situation by interrogating how these problems and responses are regulated by various institutional, physical, and administrative mechanisms, knowledge structures which maintain the exercise of power.

Today, sustainability is called as an urgent need in every business. Likewise in agriculture, taking actions towards sustainable food production regarded as urgent and imperative to feed the growing population under pressing weather conditions. Digital agricultural technologies and integration of Big Data in agriculture is suggested one of the most prominent and rational solutions for sustaining food security (Victor and Maria, 2018). Based on the perspectives of critical theory of technology and critical data studies I claim that digital agricultural technologies and the use of Big Data that they entail are the historically specific instances resulting from a wide range of socioeconomic and political transformations. I claim that uncovering these transformations is possible by applying Foucauldian genealogical inquiry into digital agriculture and writing its history of present.

3.2.1. A Genealogical inquiry of digital agriculture: Diagnosis and problematization

Garland (2014) states that Foucault's genealogical method of history of present based on preliminary works of diagnosing and problematization. Diagnosing starts with defining the present of which it is to be history. Hence, I start with diagnosing of digital agriculture as a social phenomenon than problematize it in terms of historically constituted power-knowledge regimes.

Diagnosing and problematization

Steffen et al. (2011) indicate that the intended infinite growth of business on a finite planet resulted in negative environmental results such as soil pollution, irregular temperatures, freshwater unavailability, and interrupted biogeochemical flows. Current human activities caused a reduction of the planet's ability to absorb pollutants

(Rockström et al., 2009). Humans rely on natural resources but with the rise of industrialism they have been extremely used. Now natural resources at the risk of exhaustion and earth system resilience have been endangered. Thus, keeping the balance the use natural resources by allowing them to replenish themselves become the focal point and it is called sustainability. As noted by Rockström et al., sustainability is defined respecting world's caring capacity and meeting our generation needs without compromising the ability of future generations to meet their own needs. The agriculture and food sector also has been facing multiple challenges. Farming has become an increasingly risky task, as farmers are constantly exposed to the uncertainties of weather, income prices and diseases. According to the United Nations Food and Agriculture Organization (2018), food production must increase with 60% to be able to feed the growing population that is expected to reach 9.8 billion by 2050. Factors such as climate change, rapid urbanization, depletion of viable farmland, reductions in water availability all have resulted in reduced agricultural activity. As Kahan (2008) indicates that many farmers in developing countries continue agricultural production on the edge of extreme uncertainty. They don't know how rainfall affects crops, whether their crops will be infected by diseases, what time is best to fertilize under extreme weather conditions. One of the proposed solutions that lead farmers to a more sustainable agricultural production by helping them with managing these risks is digital agriculture (Carolan, 2016b). By integrating data-based decision support systems[9] in farming, digital agricultural technologies are expected to provide farmers with better information to make more accurate and timely decisions. Sensing systems and Big Data analytics are expected to assist farmers with more predictable outcomes by advising them on good risk management and increase efficiency, productivity and sustainability. It is claimed that digital agricultural technologies enhance sustainability through more efficient use of land, water, fuel, fertilizer and pesticides Essentially, farmers who use digital agricultural technologies use less to grow more, reducing both cost and environmental impact. In other words, digital agricultural technologies that are accepted as a way of sustain food security are the results of particular socioeconomic transformations. These technologies entail Big Data use in agriculture. Wolfert et.al (2017) claim that data based, local specific agricultural knowledge is regarded as an urgent need to sustain agricultural production.

[9] Computerized program used to support determinations, judgments and action plans in an organization or a business. I had submitted a detailed work about functioning mechanism of DSS and how they affect the modes of knowledge of agricultural engineers in the previous committee.

Within the perspectives of critical theory of technology and critical data studies, I consider that Big Data as never neutral phenomena, data are never raw but always "cooked" (Gitelman, 2013). I advocate the critical perspective of CDS that data don't just exist but they have to generated. The production and use of Big Data is actively framed and interpreted by particular power mechanisms in particular social, economic and particular contexts (Bowker et.al., 2010; Edwards, 2010; Gitelman 2013).

According to Sonka (2014) and Wolfert et al. (2017) digital agriculture enhances decision-making capabilities of farmers by supporting them local specific data. According to Pope et al. (2015) digital agriculture offers precise data into actionable knowledge and ease complex decision making on farm and value chain. They indicate that farming processes will become increasingly data-driven and data-enabled. Pope et al. stated the promise of digital agriculture is to offer on-farm, local specific information to farmers. As noted in Woodard (2017) it means a shift from generalized management of farm resources toward highly optimized, individualized, real-time, hyper-connected and data driven management. Big Data technologies are playing an essential role in the development of digital agriculture: farms are equipped with all kind of sensors that measure data in their environment. As digital sensors are started to use on farms, farm data grow in quantity and scope. Wolfert et al. (2017) claim that farming cycle has been increasingly assisted by data-based decision support systems so that it has become a cyber-physical cycle. They claim that humans will always be involved in the whole process but with leaving operational activities to data-based autonomous mechanisms and smart machines. They point out that in this cyber-physical farm cycle, agricultural knowledge has been based on increasingly data-driven and data-enabled. Big Data use has changed both the context and the form of agricultural knowledge.

When I have a closer look into Big Data and digital agricultural technologies, I consider that the implications of a digital transformation on agricultural knowledge have received a limited critical attention. From a business perspective, farmers are seeking ways to improve profitability and efficiency by both reducing their costs and obtaining better prices for their product. Therefore, they need to take better, more optimal decisions and improve management control. Wolfert et al. (2017) point out that while in the past advisory services were based on general knowledge that once was derived from research experiments, there is now increasing and urgent demand for information and knowledge that is generated on-farm data in its local-specific context. With the rise of data driven farming practices, the formation of agricultural knowledge has been changing. Thus, I interrogate how Big Data in agriculture are cooked, that is to say, produced, organized, analyzed and employed for a deeper understanding towards the transforming agricultural knowledge.

All in all, sustainable agriculture today is called an urgent need. It has become a specific kind of problem for specific authorities at a specific point in time. One of the responses that are privileged to meet the urgent need and solve the problem is digital agriculture. Hence, after revealing diagnostic account of digital agriculture by the means of genealogical inquiries, I continue with revealing apparatus of regulation a complex ensemble of norms, knowledges, power relations and practices as Foucault describe dispositif through which digital agricultural technologies are produced by and within certain kinds of power-knowledge regimes. In this case, I problematize the formation of agricultural knowledge in relation to power relations historico-critically. I raise the question under which historical, social and political contexts digital agriculture and data driven agricultural knowledge are proposed as a proper solution for feeding the world sustainably. Hence, I claim that I need to conduct a genealogical inquiry towards the emergence of big-data driven agricultural knowledge. In other words, transformation of agricultural knowledge creation needs to be mapping out within the approach of “history of present”. Discussions on the creation and transformation of agricultural knowledge are located under the literature on agricultural extension and agricultural information and knowledge systems. However, much of this work is based on the progressive understanding of technology mentioned at the beginning. Studies focus on how expert knowledge is formed, how to transfer it to the farmer, and how technology and scientific knowledge can improve the farmer's knowledge. However, the encounters between expert knowledge and farmer knowledge, and how Foucauldian power/knowledge relations occur, have not yet been discussed. For this reason, I approach agricultural knowledge from a sociological rather than a systemic, quantitative perspective. I have tried to reveal not how agricultural knowledge is transmitted, but in which ways it is socialized. In other words, I attempt to examine the links agricultural information and knowledge system within political and social dimensions.

In the light of above discussions, I argue that understanding understanding how agricultural knowledge is socialized and the integration ways of digitalization requires understanding how power/knowledge struggles which are linked to surrounding political and economic systems are emerged. In order to do this, it is first necessary to conduct a genealogical study by approaching digital agriculture with the method of the history of the present, placing the actors in the historical flow, as Matserat et.al. (2015) indicate. This historical analysis, which is a kind of mapping out, shows the supporting columns and the historical breaking points that make digital agriculture one of the fundamental elements of sustainability. It conveys how power/ knowledge transform in the changing political and economic climates of the periods. Secondly, the question of how digital agriculture is experienced in the knowledge quadrilateral should be asked by conducting a fieldwork. On the other hand, the literature on the socialization of agricultural knowledge in Turkey has the same quantitative limitations and have a technological determinism approach. Hence during the literature review, I rely on archival research. I bear in my mind that genealogy is defined as a method of writing critical history: a way of using historical materials to bring about a "revaluing of values" in the present day. Hence, I decided to make a comprehensive archive review. To reach historical documents, I went to Ankara in 14.04.2022-19.04.2022 and visited the archive of Agricultural Library that is registered to International Agricultural Training Center Office of Republic of Turkey Ministry of Agriculture and Forestry. I analyzed index of archival collections with the related keywords “agricultural knowledge” “modern agriculture” “agricultural engineers” “Big Data” “digital agriculture” “technology” by examining related resources; books, articles, reports, farmer letters, lecture notes. From this reviewing, I figure out how and in which ways and due to which power relations scientific knowledge and modern agricultural technologies are diffused to agricultural practices historically and how that affected agricultural society in Turkey. Archival documents were utilized to reveal Turkey's historical experience in the socialization of agricultural knowledge. The interaction of technology and scientific knowledge with the relevant actors, and how agricultural knowledge was related to the power relations, economic and political climate of the period have been uncovered through a genealogical approach. Literary sources were also consulted to reveal Turkey's agricultural experience. In this way, the transformation of the historical periods that generate today's big data-driven knowledge and digital agriculture is comprehended.

4. A FOUCAULDIAN PERIODIZATION OF SOCIALIZATION OF AGRICULTURAL KNOWLEDGE IN TURKEY: A GENEALOGICAL INQUIRY TOWARDS POWER/KNOWLEDGE PRACTICES

Comprehensive model of AKIS indicates the relationship between agricultural knowledge quadrilateral that is formed of flows between research, education, farmer, decision support systems with the construction of economic, political and social systems. Matseart et.al. (2015) point that understanding today's mechanisms of agricultural knowledge generation requires a historical perspective. It is necessary to evaluate these mechanisms as a result of the historical flow and to situate the actors in the flow of history. To do this, this study applies Foucault's history of writing which focuses on historical breakdowns, ruptures and discontinuities. To understand the transformation of agricultural knowledge process, historical transitions of Turkey's agrarian structure and forms of production are required to be followed. The change in agricultural structures also shows the change in agricultural knowledge (Nowack et.al.2023). While presenting Turkey's historical experience, studies focusing on changes in agricultural structures have also been reviewed in relation with agricultural knowledge formation. The change of the agricultural production has been one of the most debated topics throughout the 20th century. One of the most influential scholars that study class dynamics of agrarian change in Turkey, Oya Köymen (2008) states that the Turkey's industrialization from agriculture to the urban sector started later than the other countries in Europe. Capitalist development in agriculture is allowed and controlled by state intervention until 1980s and this reveal a process of agrarian change that is specific to Turkey. She indicates that Turkey remained a peasant country until 1980 by citing Hobsbawn (1995: 291) as follows: "Only one peasant stronghold remained in or around the neighbourhood of Europe and the Middle East - Turkey". The structural reasons behind the dominance of a peasant economy in Turkey have been investigated to a great extent (Köymen, 2008; Yenal and Keyder, 2020; Tahsin, 2001; Miran, 2005). To summarize briefly, the Turkish agricultural sector was guided by patrimonial statism until the mid-1980s, although its dominance varied between particular periods. After that era protectionism phased out and agricultural production was opened to international capital (Aydın,2010). Schmidt (2020) claims that there four periods that depict Turkey's agrarian change and state intervention. According to him, the first period covers the early republican years beginning from 1923 until the mid-1940s. The second phase covers the World War II years when Turkey became a recipient of international support through the Marshall Plan programme and meet with Green Revolution[10]. The third phase depicts agrarian policy within the politically and economically tumultuous 1970s and 1980s. Finally, the fourth phase covers a period from the mid-1990s up to the early 2000s describing the neoliberal transformations in agriculture. I claim that Schmidt's order can also be utilized to trace power-knowledge regimes in terms of socialization of agricultural knowledge. On the other hand, I argue that in terms of power-knowledge regimes, the breaking points need to be ordered as the eras between 1923-1949, 1950-1980s, 1980s- 2000s and 2000s.-today. I observe agrarian change with a genealogical inquiry by tracing power-knowledge regimes due to transformation of agricultural knowledge creation and positions of agricultural engineers.

4.1. 1923–1949: The early republican years- single party period

Succeeded in fighting Turkey's War of Independence (1919-1923) by the leadership around Mustafa Kemal Atatürk and Ismet Inönü, The Republic of Turkey was established in 1923 (Zürcher, 2010). The newly founded republic needed to be consolidated political economic conditions. Shortly after the end of the Turkish War of Independence, İzmir Economic Congress was held in order to consolidate political

[10] A large increase in crop production in developing countries achieved by the use of artificial fertilizers, pesticides, and high-yield crop varieties and modern agricultural technologies.

economic conditions of the nascent Republic that was shattered by war. In the Congress, Mustafa Kemal Atatürk justified the state's role in economy (Lewis, 1966). It was also revealed that in the absence of industrial productivity and having a majority of the labour force in the rural areas, agriculture was the major source of state revenue (Pamuk, 1991). Köymen (2008) indicates that the newly established Turkish Republic inherited an unequal distribution of agricultural land from the Ottoman Empire. She also indicates that there were differences between regions in terms of agricultural development levels. This difference is emerged as a result of accompaniment of free trade agreements made between Ottoman Empire and industrialized countries of the West starting from the middle of the 19th century. Especially in coastal regions, agricultural production for the European market became widespread. The newly established Turkish Republic accepted agricultural production as a main force for development and economic growth yet there were structural challenges and unequal rural developments (Köymen, 2008: 103-106). Dumont (1984) notes that single party regime was legitimating itself as the sole representative of the nation. In terms of general interest of the nation, the interventions of the state were seen as legitimate. In those years, increasing agricultural production and improving economic development was the highest national interest and the state intervened to dissolve structural challenges inherited from Ottoman period. According to Schmidt, the most far-reaching policy of Republican People's Party's intervention was the abolition of the tithe in 1925. The abolition of the tithe represented a more favorable conditions to large landowners and freeing the small peasantry from a major burden of taxation. By this intervention RPP aimed to increase the rate of agricultural production.

In 1929, the Great Depression hit in export markets and many agricultural commodities collapsed (Pamuk, 2001). Export prices had declined by an average of 50 until 1931. Pamuk (2001) stated that the collapse of prices and incomes from agricultural exports played an important role that direct state to strengthen its protectionism. Although the state was facing the economic crisis, it continues to focus on protecting agricultural production especially restoring the domestic wheat market as the main source (Tekeli and İlkin, 1988). Through the establishment of local wheat purchasing stations, state fixed the price of harvest wheat and protect small- and middle-sized wheat growers against large landowners. The first state purchasing station was State's Agricultural Bank that initiated the price support programme (Türegün, 2016: 670). Purchasing stations were under the control of the state. Wheat purchasing was officially placed under the authority of the newly founded Turkish Grain Board (Toprak Mahsülleri Ofisi). Although the main focus of TGB's is wheat trade further crops such as barley, oats, corn, maize, rice and vegetables were constantly added. Hence TGB had become powerful channel of state's protectionism and influence on the peasantry (Tekeli and İlkin, 1983). On the other hand, the state protectionism slowed the progress of capital penetration into the agrarian sector. Selling to a protectionist state monopoly slowing down the structural adjustments that allow mechanization rural areas. Mechanization indeed was tried to be introduced to the agricultural with public resources in 1930s (Cankaya, 2013). Schmidt (2020) mentions that The Office of Agricultural Combines (Zirai Kombinalar İdaresi) was founded in 1937 bought modern agricultural machines and bring into farmers services. Schmidt indicates that state farms (devlet çiftlikleri) were established on empty treasury lands in each region of the country and started to conduct agricultural production with modern agricultural machineries. State farms aimed to help peasants in fallowing and planting and also in harvesting and threshing with agricultural machines that state purchased as a public service. Thus, farmers were introduced with modern agriculture (Unat, 2004). Moreover, in order to modernize Turkish agriculture High Institute of Agriculture (Yüksek Ziraat Enstitüsü) was established in 19333 (Aşkın, 2017:103). By establishing this school, agricultural engineers and technical staff (ziraat teknisyenleri, formenler) started to get trained to approach Turkey's agricultural problems scientifically. Turkey took a big step towards modern agriculture with the start of training its own agricultural scientists (Timur,2000:63). Furthermore, later in 1930s, within the scope of Kemalist reforms, research institutes were established in different regions of the country conduct studies on the determination of seeds and rootstock varieties, soil analysis, improvement of their adaptation for each region (İnci, 2010). The main purpose of research institutes is to conduct scientific research on food and agriculture to cooperate with the High Institute of Agriculture which is turned to be Agricultural Faculty of Ankara University in 1948

The effects Great Depression in 1929 caused statist economic models to be adopted (Köroğlu, 2017). Policies were developing in parallel with this economic model. The most important political goal of the early Republich period of Turkey is to create and defines Turkish nation. In that period, strengthened estatism with nationalism depicts an imagination of a nation without social class (Toprak, 2013:420). One of the main discourses that reinforced this populist imagination iss "peasantism"

(Ateş, 2021). Köroğlu indicates that the bond established between nationalism and the village has shaped the discourse of peasantism. The peasantism discourse of in the single-party period is prepared the legitimate that revealed the model rural development in terms of nation-state building. She mentions that the peasantism discourse advocate that modern education is imperative in the villages in terms of rural development and nation wealth. Peasant education become the most important topic in that era employed by many organizations[11] within the framework of nation-state building (Şimşek, 2005: 71). One of them was village institutes. Ateş (2021: 80-85) points out that village institutes are established to educate peasants in the framework of nation-state modernism to become village teachers so that they can educate peasants to qualify the labour in rural areas and spread ideology. Since agriculture education is the most prominent subject of the village institutes and my main focus is to analyze power-knowledge regimes in terms of agriculture knowledge creation. I find it worth examining under a separate heading.

Establishment of village institutes

The education program of the institutes started on April 17, 1940. It includes teaching literacy, construction and building principles, upskilling of carpentry, the scientific methods of raising livestocks and agricultural production. Agricultural education was one the most prominent subjects (Karaömerlioğlu, 1998: 48). Institutes were especially established in the places that are suitable for agricultural production as one of the most important aims is to increase efficiency of agricultural production and spread the modern agricultural knowledge (Demirci, 2021).

[11] For a detailed examination of the actors and organizations in the nation-state modernization process in Turkey, please see: Şimşek S. (2005). People’s Houses” as a Nationwide Project for Ideological Mobilization in Early Republican Turke. Turkish Studies 6(1). 71-91.

Photograph 4-1: A view of Çifteler Institute in Eskişehir building location that is surrounded by Hamidiye river that is important for agricultural irrigation (in the front) and forests

According to article 1,6 and 11, teachers of institutes were responsible to train scientific methos of agriculture by preparing fields, vineyads, gardens, improving seeds and plowing animals (Charter of Village Institutes, 1940). The importance given to agricultural production by the village institutes also shows itself in the agricultural anthem of the institute: “Sürer, eker, biçeriz, güvenip ötesine, Milletin her kazancı, milletin kesesine, Toplandık baş çiftçinin Atatürk’ün sesine, Toprakla savaş için ziraat cephesine.” (Baykurt, 2022) In his book “Education in The Village” İsmail Hakkı Tonguç (1938) who would be the General Director of Village Institues in 1940, implies the importance of heuristic agricultural knowledge of peasant in agriculture.

> The first is knowledge based on experience. Peasants become a part of this knowledge from the moment they are born. They deal with agriculture from morning till the night. Living beings in the nature are always in a change. Agricultural works are very variable to time, seasons, oily and dry weather. Therefore, they need to observe this change. Peasants produce agricultural knowledge by experiencing it and try to add these collected experiences on top of the previous experiences of its predecessors (p.175).

He also emphasized the importance of modern techniques in agriculture in terms of development as follows:

> By seeing that a field that can only be plowed by a couple of oxen and a man in a month, can be plowed in one day with modern techniques, by seeing that harvesting that could not be done for months with primitive methods and elbow grease, can be completed in a day or two with modern techniques, peasant understand how they put so much effort and struggles to nature’s risks. Modern techniques help us overcome the difficulties of nature” (s.254-255).

This understanding of İsmail Hakkı Tonguç towards agricultural education was implemented in the village institutes. The formation of agricultural knowledge is two ways, teachers training for village were transferring the modern techniques and scientific findings and students that is to say peasants were allowed to contribute in terms of their traditional knowledge. The first attempt to modernization of agriculture was implemented within the reciprocity principle and attempts towards modernization of agricultural knowledge was intended to be farmer driven. Abdullah Özkucur (1985) who was a graduate of Çifteler village institute Eskişehir, mentions the quality of the agricultural educations that they received. He writes about how they eagerly followed the advices of their agriculture teachers and established vineyards and vegetable gardens and planted fruit trees. He mentions, after the results of these works came to light, local community started to asked "could such products grow in these lands?" (Özkucur, 1985:62-66)

Photograph 4-2: The picture of Çifteler students and agriculture teacher returning to the institute after working in the field
Reference: (Özkucur,1985: 65)

Fakir Baykurt (2022) draws an analogy between a practice of agricultural production and establishment of Village Institutes. He firstly explains the term *gyrisma*[12] in agriculture. Gyrisma is a word of Greek origin *γύρισμα*, meaning to turn inside out, to turn round. It is an act of cultivating the soil by digging and replacing its minerals from bottom-up. Baykurt indicates that establishing village institutes are resembling as an act of social gyrisma as they raise versatile people in rural areas by educating them with modern knowledge and lifting them to become a teacher. Baykurt points out that the educational model of the institute was inclusive. Especially in the agriculture, teachers were transferring scientific methods but they also listened and learned from the cumulative, heuristic and embodied knowledge of farmers that is transferred from one generation to another. Baykurt also states that practicing and experiencing scientific knowledge were the focal point of the education methodology of the institutes. As a student of the Gönen Village Institute, he indicates that they internalize the modern methods and learn them as a kind of life experience. He emphasizes that the agricultural productivity of the villages was increasing as peasants internalize the scientific methods and their traditional knowledge coherently. For

[12] Baykurt'un metninde "kirizma" olarak geçmektedir.

example, the conditions of preservation of newly harvested wheat, barley or beans were improved with the traditional soil knowledge of peasants with the scientific measurements about the depth of the soil that they place the crops for getting prepared for winter.

All in all, within a genealogical inquiry I should note that the power- knowledge regime of the single party period is constructed by the intent of RPP to developing a nation-state consciousness and spread secularism in rural areas. Economic development was depended on agricultural production hence increasing agricultural production was regarded as urgent need. This urgent need was met by state's protectionism and a nationalistic development model by establishing Agricultural Bank, state farms, research institutes and TMO. While establishing Village Institute, RPP also intended to enhance its ideological power by spreading Kemalist reforms in villages. It was also an attempt to modernize agricultural knowledge in a farmer driven way by utilizing the traditional embodied knowledge of peasants. The transferring of scientific knowledge and modern production techniques was emerged within a participatory approach. The traditional knowledge of farmers and peasants and the scientific knowledge of modern agriculture were communicating each other.

Years between 1946-1949 was the transition period to multi-party system. Agriculture steadily in status as Turkey's most important economic sector in the decades following World War II. In the early 1940s, an essential step was taken to redistribute extensive public land. This involved distributing state-owned lands to landless peasants and village cooperatives, in accordance with the government's Land Distribution Law of 1946[13]. On the other hand, large landowners and commercial farmers were dissatisfied with Land Distribution Law. As time progressed, the effects of the war began to be felt more deeply in the Turkish economy. The Marshall Plan was an American initiative enacted in 1948 to provide foreign aid to Western Europe to help them recover economic programmes. The goal of the Marshall Plan is to prevent spread of communism[14], modernize industry encouraging an increase in

[13] Köymen argues that althought no private lands were expropriated, and the lands were distributed from the state treasuries, landowners were opposing this law. In the process of opposing this law, Adnan Menderes who was also a landowner in Aydın founded the DP and came to power.
[14] After World War II, the U.S and the Soviet Union became super powers in virtue of their military, economic and technological welfare. This led to a process called "Cold War" which was based on military, economic and political struggle between the U.S., the stereotypical representer of the capitalist system, and the Soviet Union, the main supporter of communism (Ülman,1992).

productivity (Ozer, 2014). The commitment of Marshall Plan was signed between USA and Turkey in 1948. Estatism of RPP was deteriorated with the Marshall Plan agreement. In 1949, it was announced that Turkish government decided to receive American aid to recover postwar economic conditions and foster its development.

4.2. 1950–1980s: Intensification of agriculture and modernization of agricultural knowledge in Turkey

In 1950, RPP lost the general elections to the newly formed Democrat Party. For the first time in the republican history, a new party came to rule led by Adnan Menderes who was a landowner from İzmir (Schmidt, 2022:46). He gained support by promising that if he come to in power, he would back the interests of rural capital (Jacoby, 2006:37). Keeping his promise after the election, Menderes implemented a range of favorable policies including mechanization that large commercial farmers began to benefit. Protective economy policies were rapidly abandoned, a free foreign trade regime was adopted (ibid, p.40). Although the Marshall plan was signed under the ruling era of RPP, its general principles were adopted by the Democrat Party. Turkey's accession to the Marshall Plan occurred largely in parallel with becoming a member of the IMF and NATO in the era of DP.

According to Ural (2021) reflections of Marshall Plan was an important breaking point in agrarian change in Turkey. In cooperation with the Turkish Ministry of Agriculture and the US expert group, an agricultural development program was prepared in 1949 and Turkey started to order agricultural machinery (Ozer, 2014). There were 40.000 tractors in Turkey's agricultural landscape and the ownership was concentrated in favor of large landowners in 1951 (Ozer, 2014: 433). The domination of tractors results labour-displacing mechanization in Turkey. Marshall aid brought about a number of significant impacts such as agricultural mechanizations, leading farmers to take over the modern agricultural techniques, enlargement of farmlands and increasing agricultural production (Kunz,1997). Ozer (2014) claims that Marshall aids contributed to economic growth and increase. Ertem (2009) emphasizes this economic growth must be interrogated that in terms for whom and what extent. Mechanization of the agriculture and cheap credits strengthened the landowners financially and the traditional relations of production in the countryside were started to dissolute (Keyder, 1983; Köymen, 1988; Yenal and Keyder, 2018). Mechanical power of tractor speeded up the performance of farms and hand labour become unpreferable. Landowners evicted tenants and sharecroppers. Thus, many agricultural workers chose migration from rural to urban areas and become proletarian under capitalist agricultural evolution. The process of proletarization through modernization of agriculture became the subject of literature.[15] For example Yaşar Kemal (2022) in his book entitled "Hüyükteki Nar Ağacı" describes Çukurova as follows:

> It mows and beats it before stuffing it in a sack and handing it over to you. There is no more work to be done. Hundreds of laborers come and depart. (...) Aga had all of the oxen sold. You remember that machine? He sacrificed the yellow and purple oxes at the bottom of the wheel the day he brought it. He poured his blood at the wheels' base. He gave the yellow ox to the machine as a sacrifice. (p.20).
>
> Bu var ya, hem biçer hem döver, hem çuvala doldurur verir eline. İş kalmadı gayrı. Irgadın bini gelip bini gidiyor. (…) Öküzlerin hepiciğini sattı Ağa. Şu makina var ya, onu getirdiği gün sarı öküzlen mor öküzü tekerleğin dibine kurban kesti. Kanını tekerlerin dibine akıttı. Sar öküzü kurban etti makinaya (p.20).

Also, Orhan Kemal (2021) in the book of "Eskici ve Oğulları" represents capitalist agrarian change and American model of rural development in Çukurova as follows: "An Americanism had begun. Then colorful and shaped tractors began to pour into Çukurova. The plain was strewn with these bright green, blue, and yellow toys. There was no work available for anyone." (p.38). "Bir Amerikancılık başlamıştı. Daha sonra renk renk, biçim biçim traktörler akmaya başladı Çukurova'ya. Ova bu allı, yeşilli, mavili sarılı oyuncaklarla doldu. İnsana iş kalmadı" (p.38).

Furthermore, traditional relations of production also dissolute for small farmers as well. Marshall aids were delivering through Agricultural Bank of Turkey. Small farmers had the option to get benefit its loans through cooperatives. Also, in accordance with liberal economics, DP facilitated the transportation on the highways and enabled the villagers to integrate their product into the market (Cankaya, 2013). Ayata (1986) indicates that such a great increase in the number of tractors, agricultural loans and accessing markets transform subsistence farming to petty commodity producers. Agricultural modernization directed small farmers to increase their production and enlarge farmlands. The distinction between peasant/farmer was made

[15] Proletarization through modernization of agriculture was one the most discussed topics in different areas of social sciences. To developed a different perspective, I quatoted texts of Yaşar Kemal and Orhan Kemal to trace agrarian change and mechanization in Turkey. As Joan Rockwell (1974) argues literature is not simply fantasy or entertainment; it is a social product that provides information about laws, customs, social structures and institutions, values and especially the time of important social changes. He claims that literature can be treated as a reliable source of information for exploratory qualitative researchers. With the interpretive turn in social sciences, document value of literary texts was approved and they started to be used in sociological and historical analysis (Rockwell, 1974; Merriam, 1988;Bogdan and Biklen, 1998; Mcculloh, 2004).

that is to distinguish the production for subsistence from production for market (Roberts, 1990) In other words, agricultural modernization meant a whole set of transformations that make agricultural production become capital intensive. As increasing investments of capital took place of human labour in agricultural production, agriculture started to become industrialized. Corporate power started to be concentrated in agricultural production. Gürel (2011) mentions that Marshall Plan aids were delivered at two levels respectively as direct and indirect. The direct ones were the grants, credits and loans. The indirect ones called “the right of circulation”. Indirect aids guaranteed purchasing opportunities for Turkey to import goods from U.S. Also, technical aids also counted as indirect aids. As the consequences of American advisory support, DP transformed agricultural organizations as centers that adopt and expand modern agricultural practices in Turkey’s landscape. This era was called the development of Agricultural Ministry (Zincirci, 1994:60).

Zincirci (1994) conducts a study to write the history of agricultural organization in Turkey. According to his study, in the era of 1945–1980s, the state was guiding agricultural modernization with establishing and reorganization of the agricultural organizations. In that era, the production of modern agricultural knowledge was also enacted with organization of Agricultural Ministry. Some of the important developments in terms of restructuring of the Ministry can be listed as establishment of General Directorate of State Hatcheries (Devlet Üretme Çiftlikleri), Topraksu, General Directorate of Agricultural Pest Control, The Office of Agricultural Equipment (Zirai Donatım Kurumu), The General Directorate of Forage, Milk Industry, Meat and Fish Organization and The General Directorate of Evaluation and Marketing of Agricultural Products. It is important to trace the change of the approaches in state farms as well. In 1950, state farms that were closed. State farms were public services that help peasant in agricultural tasks by introducing them modern agricultural techniques. Instead of state farms, state hatcheries were established (ibid p.18). The purpose of establishment of state hatcheries was to produce such as high-quality seeds, saplings and brood stocks and distribute them to the public in return for their cost. Also, they were responsible to carry out studies on breeding of plants and animals. The emphasis of public service was invalidated in state hatcheries. They were not established state treasury but renting places to carry out production activities and construct facilities. Moreover in 1952, General Directorate of Topraksu (ibid p.29) was established and organized as regional directorates in the country’s territory. Its main aim was analyzing soils of farmers to help them conduct proper fertilization and irrigation. Topraksu was a significant organization because with the proper guidance of farmers fertilization and irrigation were conducted in terms of the needs of the soil which preserve its structure and natural balance.

In addition to this, in 1957, General Directorate of Agricultural Pest Control was established to analyze the recommended pesticides for agricultural diseases and determine the most economical and effective method in Turkey's conditions. It also aimed to minimize product loss from diseases and ensure that agricultural products reach the desired quality in the domestic and foreign markets. It should also be noted that the Office of Agricultural Equipment (Zirai Donatım Kurumu) had been established in 1945 for maintaining the technical tools for increasing agricultural production. With entering Marshall aids to the country and rise of the implications of green revolution and liberalization of agricultural sector, it turned to be an office that seek to supply all kinds of machineries, pesticides, irrigation systems hybrid seeds and chemical fertilizers used in modern agriculture. Furthermore, The General Directorate of Forage, Milk Industry, Meat and Fish Organization were established in the beginning of 1960s to make plans for livestock development. They were encouraging private sector to establish animal farms, forage factories and integrated milking plants and encouraging the establishment of cooperatives. They were also responsible to prevent price fluctuations in those products. The General Directorate of Evaluation and Marketing of Agricultural Products was established in 1965 to conduct research and examination of agricultural products in terms of variety, quality, price, quantity both in domestic and foreign markets. Also, it was responsible to determine supporting purchases to be made by the state, ensuring a stable production, making the best use of farmer labor, encouraging the rise of quality production, determining the base prices of agricultural products (ibid. 27-37)

Photograph 4-3: A document from 1960s that desctibes Agricultural Ministry as the guide of farmers
Reference: (Şenocak, 1962: 85)

The five-year development plans of the state between 1963 and the 1980s emphasized the modernization and capitalization of agriculture (ibid.38). Policies were made for disseminating modern farm machinery, chemicals, fertilizers, improved seeds, cheap credits. According to Griffin (1979:13) green revolution was a technology transfer in a hierarchy from developed countries to underdeveloped countries. The knowledge related with modern agriculture was also transferred hierarchically. Turkey accepted American development model by receiving Marshall aids and it had a significant impact on public education as well. Especially upon the membership of Turkey to NATO in 1952, the influence of USA began to be felt intensely in every sphere of public. In accordance with American development model, several institutes and organizations were established or reorganized to adopt modern agriculture and started to conduct scientific experiments to improve it.

To adopt modern agriculture, there should be integrated institutions that produce and circulate the scientific knowledge by conducting proper experiments and deliver the technology to the end users, farmers. Hence engineers, technical staff and educators from America were invited to Turkey to transfer modern technology and new forms of agricultural knowledge. Research institutes became centers that follow the developments of modern agriculture by producing scientific knowledge about breeding plants and animals, analyzing the soil fertility and performances of fertilizer, seeds and irrigation systems. Higher Agriculture Institute had been converted to Agriculture Faculty of Ankara University (Timur, 2000). In the beginning of 1950s, agriculture faculties were established in İzmir, Adana, Erzurum, Samsun as the need for agricultural engineers were increasing. In accordance of with American Model Development, agricultural engineers were both positioned as scientists that produce modern agricultural knowledge, technical experts that apply it and social actors that spread the knowledge. Indeed, engineers due to their special position both being social actors and technological experts at the same time catch the attention of scholars' attention in social sciences. For example, Veblen discussed whether mechanical engineers would be able to spread a left-wing revolution by conditioning the machine process. He discussed to what degree the profession of engineering could be seen as a way of social engineering to affirm a revolutionary overturn. Veblen considers engineers as symbols of scientific knowledge and rational practices. He advocates that they should rule the society in terms of their rational decisions. This technocratic social imagination can also be considered as social engineering ideology (Stable, 1986). Social engineering ideology advocates that society needs to be administered by the only rational way of science and technology. With the inspiration that take from Veblen's examination of the revolutionary potential of engineers Nilüfer Göle (2016:8-10) published the study "Engineers and Ideology". She discusses the original position of engineers to understand the project of modernity in Turkey. She points out that looking at the weight of the positivist tradition that shaped the modernization movements from the optics of engineers will give us a new reading and a new perspective related with society. She indicates that "understanding engineers provides clues to mapping social transformation". As noted in her study (2016: 11) understanding the position of engineers and approaching them as social actors help us to understand the place of positivism in our modernization history. She emphasizes that since engineers lead technological knowledge and technology itself is a socioeconomic and political a term. Hence positions of engineers as social actors carry significant socioeconomic, historical and ideological clues to draw social inferences. According to her, we can't consider the positions, functions and ideologies of engineers in Turkish society independently of the history of rationalist views modernization movement and its power relations. Within the light of these approaches, I argue that development of establishing faculties in state universities train agricultural engineers represents modernization of agriculture by the state efforts. Social engineers were positioned as social engineers by both producing scientific knowledge and spreading it. Due to accumulation of scientific knowledge, mechanization of agricultural tools and agricultural chemicals were diversifying. On the other hand, farmers need to receive advices to use new methods. Hence a public education program emerged as a necessity. In this context, agricultural engineers and technicians were positioned as social engineers to educate farmers and spread modern agricultural knowledge with the approach “agricultural extension”.

The reflections of American development model on public education program: 4-k and agricultural extension policy

Agricultural extension is methodology for diffusing modern agricultural knowledge and transferring agricultural technology to farmers for enhancing the productive capacity. Agricultural extension in Turkey was implemented with public services from 1940s to 1990s in Turkey as an outcome of American rural development model under the responsibility of the Ministry of Agriculture and Forestry. Modernization of agriculture means mechanization and chemicalization (Otchia, 2014). Modernization of agricultural knowledge means to educate farmers about the use of modern technologies such as using hybrid seeds, fertilizers, tractors and agricultural inputs. Between 1940s-1990s, the Ministry assigned agricultural engineers to smallholders in to disseminate knowledge of modern agronomic techniques and skills to improve their productivity, food security and livelihoods. In other words, as an outcome of American development plans, social engineering carried out with transferring modern agricultural knowledge and technology in rural areas by the agricultural engineers that were assigned by the Ministry (Cinemre, 2001). Until 1990s agricultural engineers were social actors that are responsible to communicate with rural communities to affect behavioral components of farmers in a desired direction through conviction, communication and diffusion by proven American methods. These desired behaviours were applying modern farming methods and techniques that increase agricultural production efficiency.

As technology transfer from America were continuing to take place and as scientific knowledge related with modern agricultural production methods were constantly producing and renewing according to researchers of the institutes and organizations that were administered by General Directorate of Agricultural Affairs, farmers started to have difficulties to follow developments. In the process of applying chemical inputs technics farmers were facing serious problems and production losses in the case of improper use. The American development model offered agricultural extension policy to transfer modern agricultural knowledge from institutes to farmers

(Tekinsoy, 2021). One of the fist implementations of the American agricultural extension was 4-K organizations. 4-K was a project about training notable leaders in the villages and farmers of the future (ibid, p.121)

Tekinsoy indicates that under the influence of American rural development model of public education 4-K organizations were established. In 1954, DP closed Village Institues. Instead, 4-K[16] organization were established by taking American 4-H Clubs[17] as a model in public education. 4-K was a free education system organized by the General Directorate of Agricultural Affairs in the 1950s and carried out by the Brach Office of Farmer's Child Education. It was thought that young generation can easily be adopted to new information and modern agricultural technologies rather than farmers. The aim of the 4-K organization was to provide education and train farmer's children (girls and boys aged 10-18) about modern methods in agriculture and housework; increasing family income; becoming a better citizen (Şenocak, 1962). It was thought that children of farmers who learn new techniques quickly could also help their parents. 4-K organizations deliver projects to children about modern techniques related with poultry, vegetables, clothing, food and nutrition. The scientific knowledge and new forms of techniques were transferring from agricultural engineers and technicians that are officals of the Ministry to the children (Tarım Bakanlığı Ziraat İşleri Genel Müdürlüğü- 5(1)1). The education model of 4-K was demonstrating the disengagement of village institutes approach. The program was ordered based on imposing modern agricultural techniques as the ultimate scientific truth. By prioritizing the efficient rate of production, the traditional, embodied agricultural knowledge of rural community were marginalized. In 4-K organizations the education was based on projects not on practicing and internalizing of the knowledge. The transformation of agricultural knowledge was one way, imposing and exclusory.

[16] In the march of 4K, the meanign of the 4-K march abbreviation reveals "Kolumda kuvvet, Kafamda bilgi, Kanımda sağlık, Kalbimde sevgi. Grubum için çalışır, Tanrıma şükrederim."

[17] The 4-H clubs formed in the USA were established between 1901 and 1905 taking into account the needs in the rural lands of the USA. It was thought that one of the best ways to use scientific methods on farms and at home was to start with youth. 4-H club is a youth club operating in rural and urban areas, carrying out projects such as farming, home construction and community services.

Photograph 4-4/4-5: Left image Retrieved from Tarım Bakanlığı Ziraat İşleri Genel Müdürlüğü-5(1)1

Reference: Right image retrieved from Şenocak, 1962: 204

I think that it is important to conduct a comparative analysis between single part period and 1950s due to changed social actors in terms of agricultural knowledge creation. Between these two era, social actors and ways of relating to agricultural knowledge have changed. In the single party village teachers were producing and teaching modern agricultural knowledge to peasant. This agriculture knowledge was embracing both the mode of experienced based cumulative agricultural knowledge and scientific knowledge. In 1950s, we see that agricultural engineers were recruited as social engineers to produce and spread modern agricultural knowledge by excluding cumulative knowledge. This breakdown can be explained by the shift from the nationalist approach in rural development to the American development model. With the commitment of Marhsall aids, intensive farming started. Also, with the development of transportation systems, peasants that were making small scale production could reach markets. It resulted increasing economic growth in agricultural production and convert peasants that had small scale production capacity to petty commodity producers. Peasants that were small scale producers became farmers that as producers for the market. Agricultural engineers and technicians became responsible to educate farmers to improve their agricultural production in terms of intensive agriculture. There was no place for cumulative knowledge in a market understanding that focus on improving production capacity and income. Within the adaptation of the American model of development, it is seen that the modern technology purchased from the USA and the knowledge about agricultural mechanization and chemicals are intended to be adapted in a top-down way to farmers. As a requirement of Marshall Aid, agricultural extension activities were initiated as a public service in order to teach farmers new techniques and increase productivity in agricultural production.

Dissemination of agricultural extension: A public service for farmer education

Agricultural extension was broadly recognized as the primary government service for providing education services and information to farmers about new technology. General Directorate of Agricultural Affairs (Zirai İşler Genel Müdürlüğü) established provincial agricultural organizations (taşra teşkilatları) were established to employ agricultural engineers and technicians to organize extension staff. Indeed, the American extension movement started from the universities and large public libraries appointed at Chicago in 1892 (Blackburn, 1984). The major impact of the program was on the development of agricultural production and rural development. The term extension education has a various type of explanation. The most accepted definition is that:

> Extension education is a behavioral science following a continuous, persuasive and discriminating educational process. It aims at affecting behavioural components of people in a desired direction through conviction, communication and diffusion by its proven methods (Singh, 1983: 188).

In Turkey, agricultural extension was conducted by agricultural engineers and agricultural technicians. They were seen as social engineers that disseminate modern agriculture techniques and knowledge. Extension stuff was in the position of experts and are above the farmer in status. They are the experts that are responsible to transfer modern agricultural knowledge to farmers. Extension is an activity that needs to be enacted with persuading farmers in terms of proven methods. Agricultural extension is an out-of-school voluntary education system for the social and economic development of people who are engaged in agriculture and to enable them to adapt to new technologies. Its aim is delivering technical information and scientific research results about agricultural to farmers, in short, it is a farmer training program that aims to bring research findings and technical information to villages, to farmers.

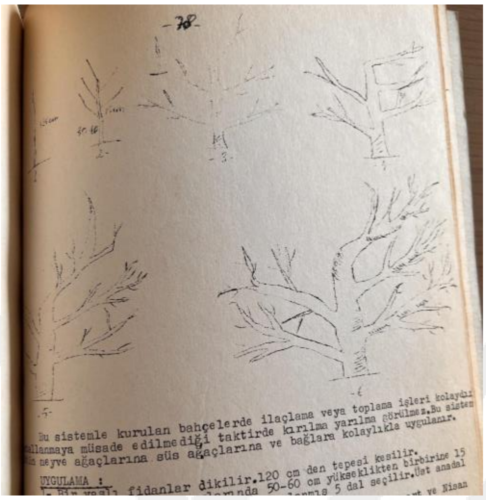
Photograph 4-6: An image that shows agricultural extension in 1960s

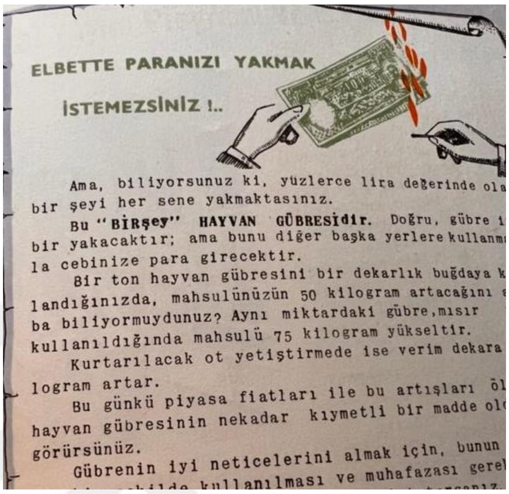
Reference: (General Directorate of Agricultural Affairs, 1960). The image refers how an agricultural technician supports a farmer in terms of new idea, research, written information, better methodology, more money, better life)

Griffin (1987) mentions that technology can't feed the population itself; it should be applied. Agricultural extension is based on educating farmers in a way that they can apply technology and modern agricultural knowledge in agricultural production properly. As for the education of agricultural extension, it is based on communication. Therefore, agricultural extension training is called "agricultural extension and communication". Since the purpose of extension is to create behavioral change in the production of farmers, agricultural engineers and technicians need to make use of certain communication tools. According to the targeted rural community, extension methods are divided into three as individual, group and mass methods.

Individual extension methods are the oldest system used by extension staff to provide information to farmers and make them gain better skills in terms of modern agriculture. Conducting face-to-face meetings with farmer, observing the conditions and the environment he lives in, understanding the value judgments enable extension staff to spread the information and techniques that are important for the rural development more easily. Individual extension may take place through face-to-face interviews, telephone conversations, field visits and personal letters.

Furthermore, group methods are the most ideal methods for attitude change. Group methods allow communication with more than one person. In this way, farmers are influenced by each other and adopt new production inputs and modern production methods more easily. Village meetings, coffee shop visits, circular letters, brochures, demonstrations are communication tools addressed to a group of farmers. Written sources need to be simple and words need to be supported with visual images to make farmers understand clearly. It shouldn't be forgotten they are the producers and don't have much time to read the letters or brochures in detail. They also be written in a plain language that titles need to catch the farmers attention.





Photograph 4-7/ 4-8: Letter on the left explain and demonstrate the effect of using proper pesticides. Letter on the right is a successful example of farmer letter

Reference: (General Directorate of Agricultural Affairs, 1960). The agricultural engineer on the left shows farmers how to spray and prune trees, the one on the right explains that animal manure should not be used for heating, but should be used to increase productivity in agricultural production)

It is not possible to reach everyone who needs and would like to utilize information with individual and group methods. Mass media such as radio, television and newspaper are used to achieve this goal. As mass media tools allow one way communication from sender to receiver, agricultural knowledge is disseminated within the hierarchy from agricultural engineers as authority to farmers as audiences, passive receivers. Mass methods are mostly used to convey new techniques, new ideas to farmers, and to warn them in emergencies. For example, in 1962, in the radio program called "Agriculture Teacher Speaks on the Radio" "Radyoda Tarım Öğretmeni Konuşuyor" Cemalettin Şenocak reads farmer letters and answer their questions. The questions were generally about the use chemicals. For example:

> There are numerous queries about soil, fertilization, and pesticides in your letters. Three essential plant nutrients are nitrogen, phosphorus, and posate. These are names that every farmer should be familiar with. Fertilisers containing these elements are known as nitrogen, phosphorus, and potash fertilizers. You will learn about these. Ammonium sulphate is a nitrogen fertilizer, whereas super phosphate is a phosphorus fertilizer. Finally, you will learn when, how much, and how to apply fertilizer based on the product you cultivate and the soil's demands. This is not a difficult task. What is food if not labor? Isn't it worth it to have bountiful harvests, more money, and a better life if you put in the effort?

> Mektuplarınız arasında çok sayıda toprak, gübreleme ve ilaçlamayla ilgili soru var. Azot, fosfor, posat üç önemli bitki besini. Bu isimleri her çiftçi bilmeli. Bunların içinde bulunduğu gübrelere azotlu, fosforlu, potaslı gübreler diyoruz. Bunları öğreneceksiniz. Amonyum sülfatın azotlu; super fosfatın fosforlu gübre olduğunu bileceksiniz. Nihayet yetiştirdiğiniz ürüne ve toprağın ihtiyacına göre gübreleri ne zaman, ne miktarda ve nasıl vereceğinizi öğrenceksiniz. Bunlar zor şeyler değil. Emeksiz yemek olur mu? Alacağınız bol mahsül, kazacağınız fazla para, kavuşacağınız daha iyi bir hayat bu zahmeye değmez mi? (p.10)

All in all, within a genealogical inquiry I should note that the regime of truth of 1950-1980s is productivity and it is constructed by modernization of agricultural knowledge and centralization of the state power. In the postwar era, since the economic development relied heavily on the agricultural sector, increasing agricultural production was regarded as an urgent need. This urgent need was met by committing to Marshall Plan and accepting an American model of development. In other words, the era of 1950-1980s was the era of planned development and the key factor of the development was regarded as modernization and capitalization of agriculture. With mechanization and rapid of increase in agricultural production due to use modern agricultural techniques, industrialization of agriculture was started. Modernization of agriculture was planned to be expanded by using public sources especially with agricultural extension policies. With reorganized institutes and organizations, the Ministry of Agriculture become a central power to disseminate modern production techniques and knowledge in rural areas. In other words, although the adopting liberal economy. Turkish State was the guardian of national development plans. It is important to note that social actors and ways of relating to agricultural knowledge have changed. In the period of early republic, within a nationalist rural development model, village teachers were educating the peasants and educated the agricultural knowledge was embracing both traditional and modern mode of knowledge. In 1950s, with the distinction between peasants/ farmers, the ways of relating agricultural knowledge has changed.

Modern agricultural knowledge that was based on intensive agriculture was transferred from agricultural engineers to farmers in a hierarchical manner. This transformation took place with extension policies. Agricultural engineers and technicians were representing the state and modernity. They were in the position of experts and their status was higher than farmers. Even though modern agriculture was tried to be popularized with methods that produce the consent of the farmers, it was accepted as a stubborn fact that traditional production needed to be replaced by scientific knowledge and modern techniques.

4.3. 1980s-2000s: Neoliberal transformations of agricultural practices in Turkey: Privatization of agricultural advisory and commodification of agricultural information

In the beginning of 1980s, criticism began to rise about the expansion activities that they didn't achieve the desired results and that the farmer's participation in these activities did not provide enough. The World Bank has admitted that its supports about agricultural extension remained insufficient up to date (Benor, 1984). World Bank stated for a sustainable rural development. agricultural extension shouldn't longer be seen just a process of knowledge transfer (Scarborough et al., 1997). On the contrary, it should be based on trust and cooperation between the extension stuff and the farmer. A greater emphasis was put on the concept of participation between researchers, extension stuff and farmers. The most important principles determined by the World Bank for the future of agricultural extension was participation. The World Bank depicted participation as a a process based on farmers' having control over the influence of development efforts (Crouch, 1991). Participatory approaches were developed as an extension without setting out predetermined goals, but rather place farmers need at the center of their work (Rölling, 1988). World Bank initiated a project called "Agricultural Extension and Applied Research" Project in 1984 to expand the participatory approach in Turkey (Özçatalbaş, 2011). This project aimed to mobilize the extension staff and bring closer to farmer by giving much more autonomy to farmer's decision. Hence, a farmer-centered agricultural extension approach has begun to be adopted. Koçak (2012) claims that this approach sees the farmer as a customer. World Bank determined the features of the participatory such as being specific to the situation, being constantly financed and being mobile (adaptive to conditions). In this approach, the extension stuff was regarded as responsible for the welfare of the farmer. Koçak indicates that in the participatory approach, it was strongly emphasized that farmers have autonomy and freedom of decision. Thus, they should undertake the responsibilities of the decisions they made. Within this approach, the high status of agricultural engineers and technicians as experts were deteriorated. They become service providers depend on farmers demands.

In the era 1950-1980s, extension stuff that were representing modernism and the power of state were visiting rural areas and introducing modern techniques to farmers. After 1980s, within the participatory extension approach that World Bank supported, it was indicated that every farmer has different needs and conditions. In other words, farmers were conceptualized as individuals that have autonomy to detect their own need and demand for information services. Stock and Forney (2016) argue that the emphasis of "individualism" and "autonomy" that were attached to farmers after 1980s were the reflections of neoliberal understandings of entrepreneurialism. Emery (2010) indicates that a neoliberal agenda equates autonomy with individual entrepreneurship and rational behaviour. With this epistemic shift, neoliberal autonomy also transformed the practices of agricultural extension into commercial consultancy forms.

In the same period, organizations of the Ministry of Agriculture were restructured (Zincirci,1994). The name of the ministry become Agricultural and Foresty Ministry and many agricultural organizations and institutions that were established in 1950-1980s were administrated under General Directorate of Rural Services (Köy Hizmetleri Genel Müdürlüğü). The separately centralized powers of the state were converged. According to Zülküf Aydın (), it was the reflection of decentralization of the state. He claimed that the 1980s and the years after were the end of development plans and policies in Turkey. He also claimed that the central role of state in 1950-1980s was no more valid in that era. Within the close cooperation with the IMF, the World Bank, the WTO and the EU Turkish agriculture was internationalized under control of transnational agribusiness and their domestic partners. In other words, Turkey's integration into the global economy was started. Peck and Tickell (1995) indicate that WTO and World Bank were the most far-reaching forces that sought to impose a neoliberalist agenda and reshape domestic economies and nation-state trade agreements. They advocated implications of a freer world trade and support particular aids and funds. With the adoption of neoliberalism, an extensive opening of domestic markets to overseas competition was emerged. Transnational corporations were started to provide particular opportunities as state's existence was deregulated and rolled back. Struggling with debt-related economic and financial problems, nation states in the developing world showed tendency to accept these opportunities The World Bank also provided significant financial help to nation states to be integrated in transnational market.

Under the crippling economy and the impacts of political and social problems of 1970s and early, 1980s Turkey also adopted neo-liberal policies. Agriculture was among the first to be affected by this change. IMF, the World Bank and the World

Trade Organization, US, the EU have been supporting aid programs for developing countries to adopt neo-liberal agricultural policies. The project of Agricultural Extension and Applied Research that World Bank funded was one of them. It watered downed the groundwork for positioning farmers as clients, turning agricultural extension stuff into entrepreneurs providing consultancy services. Withdrawal of the state from the economic sphere meant the beginning of the elimination of subsidies to agriculture and the reduction of public investment in the agricultural sector. In that point, state withdrawal from advisory services was emerged in terms of privatization and decentralization. According to Rivera and Alex (2004) state withdrawal might take different forms respectively as the decentralization of publicly funded services; the transfer of state-provided services to private companies partially; full privatization.

In Turkey, privatization of agricultural advisory activities partially happened. Public agricultural extension services continued but the effects were significantly reduced. The number of agricultural engineers employed by the state has also significantly decreased. As my interviewee said, many agricultural engineers have become pesticide dealers and informally consulting farmers who come to buy chemicals. According to Erdoğan et al. (2019) today in Turkey, a great majority of farmers receive recommendations from pesticide dealers for proper pesticide selection and for determining the dose of pesticides. In other words, a great majority of the farmers are relying on pesticide dealers in terms of receiving information, pest management, pesticide selection and dose adjustment. Public extension has been continuing by the Ministry but since many farmers rely on the recommendations of pesticide dealers, the effect of field visits of the officials was reduced. As one of my interviewees indicated:

> We are two agricultural engineers working in the chamber of agriculture and are responsible for many small farmers. In the field visits, we transfer the proper information according to the seasonal conditions in terms of our observation. Yet, we couldn’t follow the impact research due to time and human resource constraints that if farmers followed our recommendation or took another consultancy.

According to Klerkx and Jansen (2010), there is a significant risk in privatization of consulting. They assert that the selling of commodities including medications, fertilizer, seeds, and animal feed pays for the private advising services. In order to secure input sales and win over producers, the supplier needs to make sure he offers high-quality services that address the needs of the producer. In addition, the provider makes recommendations based on the product offerings, guided by the financing arrangement. The farmers purchase more inputs than usual as a result. Put differently, these suggest that for the purpose of advancing their commercial endeavors, private services—such as input and agricultural equipment suppliers—offer advice services. Klerkx and Jansen also argue that technical assistance of pesticide dealers is not based on through regular farm visits. The advices of fertilization are given without observing the results of soil analysis and pesticides were given without visiting the fields and observing the conditions of production in place. Moreover, commercialization of extension services also took place when Turkish government started to organize a paid consulting certificate program. By attending this program agricultural engineers could be a private consultant that serve farmers and commercial farms commercially. Labarthe and Laurent (2013) list the risks of commercial consultancy services:

- The decreased amount of consideration of environmental issues due to commercial relationships between customers and suppliers
- Preference for technology transfer with little training of producers
- Risk of discontinuity in service provision due to changes in funding mechanisms
- Reduction in exchange of information between farmers, who do not want to share their ‘purchased’ knowledge
- The exclusion generated by the inability of some farmers to purchase advisory services.

The control and support mechanism of the stated in agriculture were deteriorated with the decentralization policies of the state. Within these policies, privatization of agricultural consultancy was regarded as an entrepreneurship attempts of agricultural engineers and farmers were regarded as clients that have autonomy to choose particular consultancy services. With the removal of state control mechanisms, the proper use of agricultural inputs started to be determined by commercial consultancy services. Farmers started to see pesticide dealers as a convenient and reliable source of information. On the other hand, as Klerkx and Jansen (2010) and Labarthe and Laurent al. (2013) argue financing mechanism of the commercial services guides the supplier's recommendations based on the product offerings. They need to promote their business by providing recommendations. As a consequence of commercial based advisory and unconscious pattern of chemical consumption, environmental problems were emerged. The process of rapid intensification that is driven by increased use of fertilizers and other chemical inputs have caused negative environmental outcomes such as reduced soil fertility, air and water pollution and destruction of biodiversity (Tang et al. 2014).

All in all, within a genealogical inquiry I should note that the regime of truth of 1980s-2000s is also productivity and it constructed by privatization of modern agricultural knowledge and decentralization of the state power. Neoliberal transformation replaced protectionist policies of the states with free-market implementations. The growth of corporate power coproduce with the domination of productivist logic and commercialization of modern agricultural knowledge. During this era, neoliberal policies converted the social positions of actors in agricultural productions. Farmers started to be seen as clients, agricultural engineers started be seen as entrepreneurs and transnational corporations sought to invest more capital in agricultural production. With the removal of state control mechanism, closure of institutions that direct proper use of modern agricultural practices and commercialization of agricultural consultancy, agricultural production started to be conducted by using significant number of chemical inputs. The negative environmental impacts of intensive agriculture revealed as polluting soils, waterways, and other ecosystems and sparked the sustainability debates.

4.4. 2000s- Today: Datafication of agriculture

“Our biggest competitor is no longer Monsanto, it’s Google.
(Rick, leading spokesperson for an agribusiness)”
(Bronson and Sengers, 2022)

At the turn of twenty-first century, neoliberalism policies were expanding and aiding in globalization, transnational corporations gained a significant power. They command the vast number of resources and become able to guide an immense political power. Also, in that era with the advancements of information and communication technology, digital technologies started to drive a transformative change in global economy. The advancements of information and communication technologies made possible to identify, access and analyze different large data sets. Types of ICT services and applications become data driven. The emergence of Big Data holds great promise for business to support timely, accurate and insightful information.

As Big Data infrastructure is developed and expanded, it has been being leveraged to improve functioning of both public and private services such as healthcare, transportation, education. The Big Data ecosystem has an impact on agriculture as well. It was suggested that Big Data technology make agricultural production more sustainable as with precise measurements fewer chemical inputs needed to be used. Technocentric studies argue that the consequences of digital agriculture support agricultural and environmental sustainability (Lu and Grundy, 2017). It was claimed that precise measurements support predictability and help to prevent product loss. Also, it was argued that the human sources as agricultural workers have gradually decreased so labor-substituting agricultural robots might deliver efficient solutions (Schacklet, 2021). High-tech companies made considerable investments in infrastructures of agricultural data acquisition by advocating how digital technologies are improving the food system. With the development of infrastructures, farm management started to be transformed as a data driven task. Digitalization in agriculture started with using smart sensors that collect and analyze historical data about soil characters, seeding rates, crop yields, weather conditions and geographic information data collected by the satellites (Schönfeld et al.2018). With the assistance of Internet of Things, farming methods started to be integrated with the use of automatic tractors, vertical farming, smart weather stations, agricultural robots.

With the rise of Big Data technologies in agriculture and commercialization of agricultural consultancy services had an epistemological break. Information technology businesses entered into market and datafication started in agricultural production. Datafication is a term that was coined by Schöenberger and Cukier (2013) that implies how all aspects of life have been turned into data and extracted as an economic value. According to them, it is primarily driven by digital data collecting projects carried out by government agencies and commercial businesses. These projects collect data from a variety of sources, including the public sector, customers, satellite data, and an expanding number of geo-positioned devices. Information technology companies support data-based decision support mechanisms to farmers. They owned the datasets and statistical knowledge about Big Data technology in terms of searching data, aggregating, storing, processing and analyzing relating it with different agricultural datasets to get optimum conclusions. Hence, they teach how to use decision support systems and provide recommendations to producer who has difficulties about using the system. Likewise agricultural consultant, pesticides dealers' information technology and high-tech companies become the source of information and support agricultural consultancy to producers.

The reason I use the word "producer" instead of "farmer" is that with Big Data use actors that produce food have changed. In Turkey, although there are big farmers can access these technologies, commercial farms that conducting agricultural production in large scale of lands use the digital technologies to increase their efficiency. Nedelkoska and Quintini (2018) indicate that although digital technologies allow to ease farm management with sophisticated analysis of complex data, human interpretive skills for decision making are still important. Big Data analysis can only be applied with the interpretations of the its user. Despite all attempts towards digitalization, agriculture still can't be fully automated and capitalized like other sectors. Agriculture has a unique position that has still strong connections with environmental variables and thus to a particular extent remains unpredictable. Thus, commercial farms employed agricultural engineers to extracted valued information and apply Big Data statics properly. Stated differently, there is still a high reliance on the user to interpret the data. Agricultural engineers become workers of the commercial farms and users of the system to interpret Big Data with their traditional knowledge and make the most efficient decisions for agricultural production.

Today, agricultural economic value has been extracting from the collection and control of farm-level data. As cited in Bronson and Sengers (2002), Goldman Sachs financial report in 2016 indicates that data is everywhere but the important point is who harvests this data. Rotta and Teixeria (2018) claim that the owners of data are mostly private companies. They are the *knowledge-lords*, the primary appropriators of *knowledge-rents*. Technology companies collecting farm level data stand to gain tremendously as the agricultural sector undergoes a process of digital transformation. According to experts, by 2050, each farm will produce approximately 4.1 million data points daily, up from an average of 190,000 data points per farm in 2014 (Michalopoulos, 2015). As a data holder, John Deere, for instance, is among the most influential businesses that dominate the agricultural Big Data sector (ETC, 2016). As they sell tractors, they have been collecting agricultural data with them for almost twenty years. Companies like Bayer/Monsanto also Access fata from a majority of farmers worldwide due to their historical relationships with them in terms of seeds and chemicals. Bronson and Sengers (2022) explain as follows:

> Since 2013, Monsanto has arguably been transitioning from being a seeds and chemicals company to a data specialist by expanding their in-house data science expertise such that they can offer putatively data-driven advice to farmers.

The implications of Big Data collection and providing decision support systems raise questions about their potential impacts on environment, labor, rural communities, health and the economy. Bronson and Sengers (2022) claim that scholars in Science and Technology Studies need to conduct critical understandings towards data-driven technologies and analyze the intersections of agriculture and Big Data. Data collection and processing are shaped by particular power relations. Hence, they claim that scholars of STS can also use Critical Data Studies frameworks to explore how data practices are shaped through domain-specific institutional pressures and power relations by illustrating this by focusing on a particular domain of data practice. I also observed that ownership of data generated by these companies has revealed many significant results for power relationships between actors in the agriculture such as farmers, agricultural engineers and large corporations. Companies are using privacy agreements to tighten corporate control over data. Newman (2017) argues that data privacy agreements emphasize the power of corporations that they have the ownership of data. Also, in my field studies, I observed that similar to other data-based economies, data shared between producers and corporations is in one direction that is from producer to corporation. I observed data injustice between producers and corporation. I realized that a significant amount of agricultural data has been collected by corporations but small amount of data turns back to them. As Kaminski-Killiany and Walker (2016) discuss, there is not a determined level of responsibility to share certain amount of usable data with the farmer whose data is being collected. I also observed that the corporation allows producers to access their data by retail. They have pay for annual membership to log into system. The conceptualizations of Rotta and Teixeria (2018) as knowledge lords and knowledge-rent were matching up with my findings from the fieldwork.

Moreover, it is possible to reinforce this sequential order, which was thoroughly explained in the preceding part, with agricultural statistical data. Despite continuous technological developments, agricultural statistics reveal that these technologies do not immediately help to improving agricultural production. Although agriculture has traditionally been a major contributor to the Turkish economy, it has steadily been replaced by other industries throughout time (Bayar, 2004:42). In order to understand the effects of changing agricultural policies on this economic activity since the early republican era, it would be beneficial to analyze statistics on the utilization of agricultural land. Through an analysis of historical progression from the inception of the Republic to the current era, it becomes apparent that the initial set of statistical information, referred to as Agricultural Structure and Employment, was made public between 1934 and 1950. Most of this data is from the year 1949. Because the State Institute of Statistics and other relevant institutions do not consistently provide agricultural statistics, it is difficult to compare agricultural productivity from one year to another (D.İ.E.,1951). On the other hand, there are significant variations in agricultural statistics in certain years. These seemingly little changes can provide helpful comprehension of the changing agricultural production landscape. After examining the 1949 statistics on agricultural land holdings and their respective values in relation to the surface area, it is clear that meadow and pasture areas are the most prevalent, making up 50% of the total land division. Agricultural activities occupy 20% of the land, with forest areas covering 13% and other types of land accounting for 17%. In 1970, there was a notable shift in land utilization. The proportion of land dedicated to meadow and pasture use, which was the highest at 50% in 1949, had a decline of 22% and fell to second place with a value of 28% (Bayar,2004:53). Concurrently, there was a 15% rise in agricultural areas, resulting in their ascension as the primary land use category, surpassing all others. The expansion of agricultural regions is a result of the conversion of meadow-pasture and other lands into agricultural zones. As a result, there has been a reduction in woodland, meadow, and pasture areas that are not suitable for farming, in order to obtain more land for agriculture. According to measurements done by the General Command of Mapping, an analysis of land division changes in Turkey from 1949 to 2000 shows that the percentage of agricultural areas increased from 20% to 34%, while the percentage of meadow and pasture lands declined from 50% to 22%. In the 1960s, the introduction and widespread use of tractors in agricultural areas resulted in a significant increase in the size of agricultural lands (Bayar, 2004:43). A further development is evident subsequent to 1980. The application of cutting-edge technologies in agriculture, coupled with the development of irrigation and fertilization infrastructure, exemplifies the transformation of unused land into cultivable terrain. During this time, the advancement of irrigated agriculture was accomplished by the use of Good Agricultural Practices (GAP) and the establishment of supplementary irrigation dams. Actually, it had a decline of 41% between 1980 and 2000 (Gözenç, 1980). In essence, the increase in the proportion of agricultural lands occurred by expanding agricultural techniques to areas that are unsuitable for farming due to their inherent conditions. On the other hand, the highly productive agricultural areas are subject to being utilized for non-agricultural activities. From 1991 to 2000, there was no net change in the total amount of agricultural land. However, it is worth mentioning that the agricultural areas that were lost during this period were of higher significance compared to the newly established ones. The majority of the cultivated regions, predominantly located in the coastline region of Turkey, have been largely transformed into residential or tourist areas due to the increasing dominance of non-agricultural industries between 1990 and 2000 (Bayar,2004:45). According to the statistics of the D.İ.E., following 1990, the combined effects of urbanization and the growing significance of non-agricultural economic sectors led to the conversion or abandonment of agricultural lands. In the initial years of the Republic, the density of the agricultural population was remarkably high throughout the entire nation. Nevertheless, a noticeable shift in this pattern becomes evident by the year 2000. In 1935, the majority of the working population, specifically 82%, were engaged in agricultural activities, while 10% were involved in industrial work, and the other 8% were employed in the service sector. Nevertheless, by the year 2000, the proportion of individuals engaged in agricultural activities had declined to 48%, and the proportion of individuals employed in the industrial sector had risen to 18%. Notably, the services sector had the most significant growth, with 34% of the population working in this field. Urbanization and industrialization have started to dominate upon arable land, especially in coastal areas (Ustaoğlu and Aydınoğlu, 2019). Concurrently, portions of pastureland characterized by soil types that are not appropriate for farming, infertile lands, rocky terrains, and forested regions - all of which should be conserved - are being transformed into agricultural land. Agriculture, which played a vital role in the early years of the Republic, steadily declined in importance and was unable to compete with other industries in terms of both labor force and land area. Although there have been significant breakthroughs in agricultural technologies, irrigation, and fertilization, the anticipated increase in terms of land area did not materialize. The migration from rural areas to urban centers, especially those in close contact to large cities and metropolises, has surged as a result of the attraction of enhanced career prospects, education, and healthcare facilities. Consequently, the rural population faces a scarcity of resources necessary for farming, resulting in a substantial decrease in agricultural regions. Conversely, fewer labor-intensive crops are being cultivated in lieu of more productive ones. In the early years of the Republic, there was a notable prevalence of individuals involved in agricultural pursuits. Nevertheless, by the year 2000, a noticeable shift in the distribution of the population had taken place. In 1935, the agricultural industry employed the bulk of the economically active people, approximately 82%. Meanwhile, 10% of the population were employed in the industrial sector and 8% were employed in the services sector

(Bayar,2004:47). Nevertheless, the proportion of individuals engaged in agricultural activities had declined to 48% by the year 2000, when the industrial sector accounted for 18% of employment and the services sector accounted for 34%. Rural areas mostly focused on agricultural activities and the cultivation of crops. Agriculture, an essential economic pursuit in the early years of the Republic, eventually declined in importance and was unable to compete with other industries in terms of both labor force and land area. Although there have been significant breakthroughs in agricultural technologies, irrigation, and fertilization, the anticipated increase in terms of land area did not materialize. The process of rural-to-urban migration, driven by the availability of better job opportunities, education, and healthcare, has begun. Topçu (2012) found that the usage of agricultural land decreased by approximately 11 million hectares between 1970 and 2010. However, since the year 2000, around 2 million hectares have been lost. In the early 2000s, regulations were introduced to set prices for market entry in order to facilitate the liberalization of trading conditions in the agricultural sector. Moreover, there was a heightened emphasis on the corporatization of agricultural production. Post-2000 agricultural policies largely aim to improve the competitiveness and efficiency of the agriculture industry. In contrast, these modifications, aimed at improving competitiveness in agricultural production, led to an increase in the number of agricultural firms and a decrease in the number of farmers. TEPAV reports a steady decline in the number of farmers in Turkey. The data indicates a consistent and significant decrease, particularly within the past decade. The agricultural labor force experienced a decrease from 1,127,000 individuals in 2008 to 600,000 individuals in 2019. The TEPAV employment report for 2022 indicates a substantial decrease in the number of farmers, reaching the lowest point in recent years. The data indicates that the number of farmers registered in the Farmer Registration System has decreased to 493,000, which is the first time it has fallen below 500,000. The departure of farmers from the land invites investigation into the intended recipients and specific categories of production for which the recently created agricultural technology is geared. The "General Agricultural Survey" has been done on seven occasions in Turkey, specifically in the years 1927, 1950, 1963, 1970, 1980, 1991, and 2001. Since 2001, agricultural survey data have not been shared. In 2023, the General Directorate of Agricultural Reform of the Ministry of Agriculture and Forestry and the Turkish Statistical Institute (TurkStat / Tüik) agreed a protocol to carry out a "General Agricultural Survey". However, the publication of this survey is still pending.

All in all, within a genealogical inquiry I should note that the regime of truth of 2000s- today is sustainability and it is constructed by datafication of agricultural knowledge and concentration of corporations as knowledge lords and appropriators of knowledge-rents. In other words, they become data powerhouses. Transformation has been emerging from knowledge-driven agriculture to data-driven agriculture Agricultural Big Data practices build on long histories of corporate consolidation and domination. Forces of industrialization have been central to the development and expansion of digital agriculture technology and knowledge. Agribusiness companies turned into data powerhouses (Bronson and Sengers, 2022). In terms of privacy agreements, data collected from producers were utilized for corporate profit and farmers have almost no agency in determining consent rights to their data.

As a result of my literature and archival review, I was able to uncover Turkey's experience in the socialization of agricultural knowledge by situating the relevant actors in the historical flow. As Matseart et.al. (2005) created a timeline in the context of Bangladesh within the framework of comprehensive model of AKIS, I employ the data visualization tool *Canva* to create timeline of socialization of agricultural knowledge in macro-level.

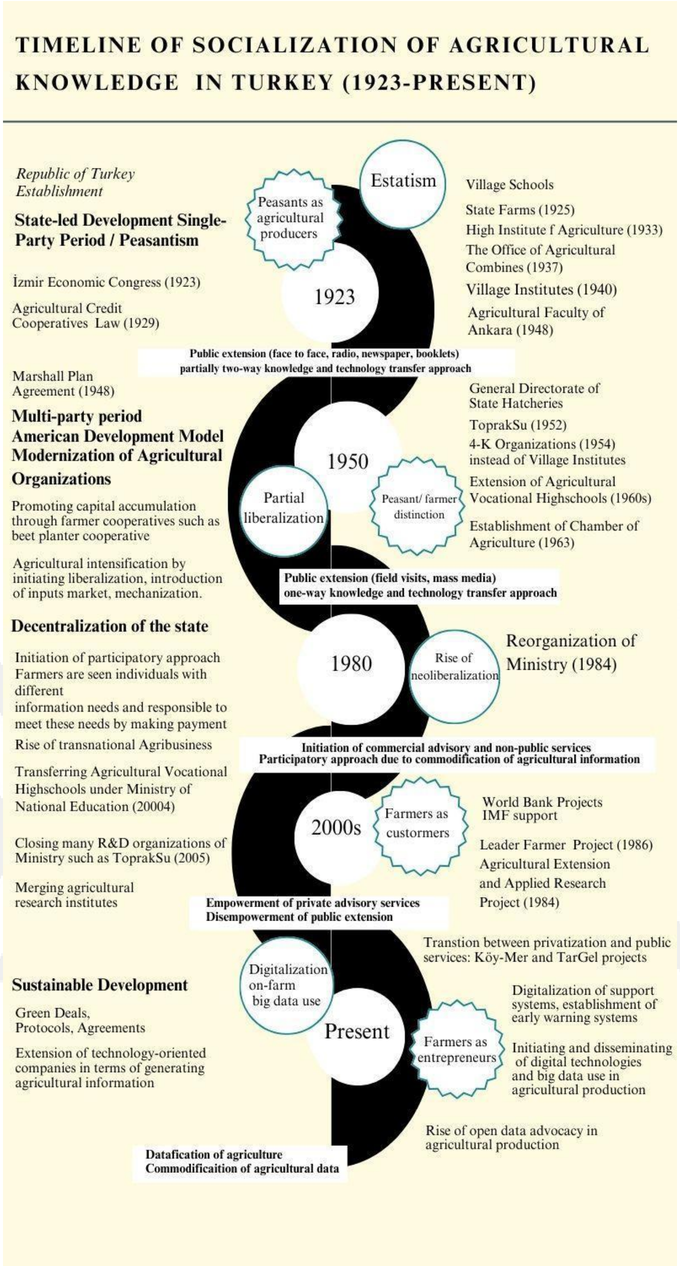


Figure 4-1: Historical experience of Turkey in terms of socialization of agricultural knowledge

Writing digital agriculture's, the history of present in the context of Turkey supported me a critical understanding of how power relations have been constructed in terms of agricultural knowledge formations, which actors, institutions and policies were responsible for producing that particular power-knowledge relations. I uncover how particular power-knowledge mechanisms privilege particular knowledge production and circulation. It helped me to explore how political economy organized the patterns of transferring agricultural technology and knowledge to different actors such as agricultural workers, farmers, engineers, corporations. This historico-critical analysis helped me to understand special context of the agricultural society of Turkey. This thesis investigates how digital agriculture is experienced rather than what it is, and how it is socialized through big data, it will focus on the early warning messages donated by the ministry, analyzed and delivered to farmers through its directorates. It will look at the effects of digital agriculture on the socialization of agricultural knowledge and ultimately its impact on sustainability. As mentioned above, within the conceptual framework of STS, technology is accepted neither good nor bad nor is it neutral. It is the result of a complex process of negotiation in which a variety of social actors and institutions are involved. Digital agriculture and Big Data technology that it entails are no exception. They have been evolving in terms of complex political, economic and power relations. Within a genealogical inquiry, I attempted to approach digital agriculture as a consequence of those historical relations and trace historical experience of Turkey in terms of agricultural knowledge socialization.

5. ASSESSING FORMS OF RESISTANCE REGARDING POWER/KNOWLEDGE STRUGGLES IN SOCIALIZATION OF AGRICULTURAL KNOWLEDGE

In the previous chapter of the study, within the framework of critical Science and Technology studies, I evaluate producing scientific knowledge and technology as a result of certain kinds of power relations in political and economic context of agricultural production. I try to explore how agricultural knowledge and technology is produced, distributed and transferred to farmers due to construction of regime of truths. Foucault claims that regime of truth is produced by the relation between science, governance and the flux of political and economic ideologies (Lemke,2015). According to him, regimes of truth are constructed by ideologies which set the rules of discourse, definition and categories that holds certain things to be truth. He claims that knowledge is produced according to regimes of truth that are constructed by power relations (Foucault, 1980). For him knowledge always includes exercise of power and power always carries a function of knowledge. Accordingly, he implies that the notions of knowledge and power are intertwined and so he conjoined them into a single term called *power/knowledge* (ibid). Foucault uses the term power/knowledge to imply that power is constantly exercised through accepted forms of knowledge, scientific understanding and regimes of truth (Rainbow,1994). Observing agrarian change through the notion of power/knowledge help me to discover which regimes of truth that are shaped by economic and political interests impose themselves in agricultural production.

Today, with the rising effects of environmental problems such as water depletion, environmental change and scarcity of arable lands, sustainably producing healthy food for world’s population become one of the most significant challenges of this century (Fraser et al. 2016). One of the proposed solutions of addressing this challenge is digital agriculture that utilizing data driven technologies in agriculture (Rotz et.al, 2019). Some propose that application of big data could enhance decision making of farmers towards producing food on less land with fewer inputs which lead sustainability (Franks, 2014). On the other hand, data-driven agricultural technologies are capital-intensive and the ownership of data generates particular power/knowledge relations. In case of agrarian change, data driven agriculture might be regarded as the next frontier (Pflueger, 2002) and the sustainability is the regime of truth. To understand this transformation, I apply Foucault's history of present methodology to evaluate digital agriculture as a present phenomenon and mapping out the political and economic forces that led to digital agriculture formation in terms of power/knowledge relations.

Applying Foucauldian genealogical methodology of history of writing allow me to mapping out agrarian change in terms of agricultural knowledge production and power relations. Starting from datafication of agricultural knowledge, I aim to uncover sociopolitical and economic contexts of producing scientific knowledge and technology. I find out that I need to evaluate power/knowledge regimes in four eras such as 1923-1949, 1950-1980s, 1980s-2000s, 2000s- today. This analysis allows me to understand how certain economic and political powers shape the production of agricultural scientific knowledge and technology in Turkey. I interrogate the power-knowledge regimes behind technological developments by asking the question *cui bono*- "who benefits from specific configurations of science and technology?" (Felt et.al. 2017:2). While this analysis critically exposes the power/knowledge mechanisms behind agrarian change, it remained highly structural. These four eras are determined as historical breaking points due to changes in political structure and the social fabric of agricultural society by focusing on distribution of scientific knowledge and technology. Yet, the analysis is at the stake to imply primacy of structure over agency, to conceptualize power as a possession coming from a center and disseminating in a hierarchical manner up to bottom. Yet Foucault challenges the idea that power is wielded by dominant ideologies in a manner of up to bottom (Lemke, 2015). Rather he asserts that power is everywhere and comes from everywhere (Foucault, 1998:63). For him, power is relational, it emerges out of relationship within situations (Hewett, 2004). He also asserts that power relations include opposite forces as power and resistance occupy the same place (Foucault, 1980). Hence in a Foucauldian sense, historicity of power/knowledge relations are more complex. In constituted of power relations of transferring scientific knowledge and technology to farmers, farmers also have power by operating particular resistances by accepting, rejecting or reorganizing the expert knowledge. I intend to explore Foucault's assertion that resistance is inherent to power, as well as the various kinds of resistance employed by farmers in challenging the authority of scientific knowledge, utilizing concepts derived from the field of Cultural Studies. To illustrate this point, I reveal the tactics employed by farmers to challenge the authority of scientific knowledge and engineers using De Certeau's tactics.

The earliest years in which we can understand the socialization of agricultural knowledge through power/knowledge conflicts, the 1950s, were the years in which scientific knowledge was introduced to farmers through agricultural extension services. In this section, the experiences of experts who worked as extension workers in these years, namely engineers and technicians, and farmers who received extension services are presented. I conduct interviews with farmers, technicians and agricultural engineers during the period when public extension was widespread in order to reveal how scientific knowledge and technology was experienced. I utilized these interviews as a supporting tool for the literature review I conduct to reveal Turkey's historical experience. In this way, the previous section analyses the macro-historical breakdowns affecting the transformation of agricultural knowledge and the resistance that emerged. By relying on the argument of co-productionist framework of STS that society, science and technology are mutually constituted, it is intended to explain that technology and scientific knowledge are not transferred smoothly from top to bottom, that they encounter various resistances, and that they are transformed around social relations.

By applying a genealogical inquiry, I conclude four historical breaking points in terms of power/knowledge relation respectively as 1923-1949, 1950-1980s, 1980s-2000s and 2000s.-today. The table below presents the historical mapping of digital agriculture within a genealogical inquiry in terms of power/agricultural knowledge assessments.

Table 5-1: Genealogy of digital agriculture in terms of power/knowledge

<table>
<tr><th colspan="6">Genealogy of Digital Agriculture in terms of Power/Agricultural Knowledge</th></tr>
<tr><th rowspan="2">The Era</th><th rowspan="2">Political Rationality</th><th rowspan="2">Instrument</th><th colspan="3">Power/ Knowledge</th></tr>
<tr><th>Regime of Truth</th><th>Mechanism</th><th>Information Sources</th></tr>
<tr><td rowspan="3">Today-2000s</td><td>Neoliberalism
Green capitalism</td><td>Data driven technologies</td><td rowspan="3">Sustainability</td><td>Green Deals, Protocols, Agreements</td><td>Technology oriented companies</td></tr>
<tr><td rowspan="2">Sustainable Development</td><td rowspan="2">Big data use in agricultural</td><td>Commodication of agricultural knowledge</td><td rowspan="2">Public-nonpublic extension services
ICTs</td></tr>
<tr><td>Ownership of data</td></tr>
</table>

				Agricultural engineers, entrepreneur and farmers as clients	
2000s-1980s	Rise of neoliberalism	Green Revolution (High yielding crops, agrochemicals, mechanization	Production growth in agriculture linkages to global market	Commercialization of agricultural consultancy	The distinction between public/non-public extension services such as associations, the union of Turkish Agricultural chambers
	Decentralization of state power / Integrating participatory approach to development strategies	Global market integration.	World Bank Projects Monetary Fund of IMF EU Fund (Deutsche Gesellschaft für Technische Zusammenarbeit)	Neoliberal agency of entrepreneurship Farmers as clients Agricultural engineers as private consultants	Mass media chanells (television, radio, newspapers, radio, booklet, leaflets, letters.)
1980s-1950s	Transition to multi-party system	Green Revolution (High yielding crops, agrochemicals, mechanization)	Production growth in agriculture for national development	State-led development projects (Research institutes Agricultural high schools)	Public agricultural - extension services
	American Model of Development	Marshall Plans Modernization and mechanization of agriculture	"Agriculture is the basis of the national economy."	Farmers as citizen Agricultural engineers as social engineers	Mass media (radio,television, newspapers, letters, brochures, booklets)
1949-1923	Single Party Regime of RPP	National investments with strengthened estatism to improve agricultural production whose driving force is manpower	Production growth in agriculture for national development	State-led development by Village Institutes Village Schools State Farms Agricultural Schools	Public agricultural extension (newspapers, radio, letters, booklets)
	State-Led National Development		"Agriculture is the basis of the national economy."	Peasantsizm Developing a nation-state consciousness and spread secularism in rural areas.	

During the literature review, I rely on archival research to reveal historical experience of Turkey in terms of socialization of agricultural knowledge. I focus on structural transformations by focusing how changing economic, political factors shape socialization of agricultural knowledge. applying history of present allowed me to find out how power/ knowledge in agriculture has been exercised due to certain political rationalities, organizations and regulations in Turkey. On the other hand, this analysis needs to be improved in the light of Foucauldian understanding of power. For him, power is relational pervasive an everyday socialized phenomenon (Gaventa,2003). Hence the genealogical inquiry towards agrarian change also needs to include how power/knowledge is exercised in the relation between farmers and experts. The previous chapter, I implement a genealogical inquiry how political and economic structures shape socialization of agricultural knowledge in terms of production institutional scientific knowledge and disseminating it to farmers. It raises the first of part of the question that Harbers (2005:15) asks "how and under which social conditions science and technology are produced; what science and technology are doing with us." I attempt to answer the question that this framework also asks the other way around "what we are doing with scientific knowledge and technological artifacts?" by focusing on what farmers do with expert knowledge. On the other hand, Foucault states that resistance is immanent to power. In this section, I focus on what farmers do with scientific knowledge and what strategies of resistance they develop against power in the historical experience of Turkey. Foucault states that resistance is immanent to power. In this section, I focus on what farmers do with scientific knowledge and what strategies of resistance they develop against power. As mentioned earlier, the majority of studies focused on agricultural knowledge and agricultural society are based on the quantitative paradigm. How to transfer technology and scientific knowledge to farmers to increase productivity in agricultural production constitutes a large part of the agricultural extension literature. In this chapter, I will take a closer look at the agricultural extension activities I mentioned in the previous section in the 1950s-1980s period and the transformation of these activities in the following years. I take such a closer look through conducting semi-depth interviews with engineers and technicians who worked as agricultural extension personnel and their oral testimonies. I examine what farmers do with scientific knowledge, how they make sense of it, and how they experience it in the 1980s-2000s and 2000s-present periods when agricultural extension as a public service started in the 1950s-1980s and then transformed. In this way, I identify the forms of resistances that Foucault claims are embedded in power/knowledge. In doing so, I try to depict Turkey's experience of the socialization of agricultural knowledge in gray, rather than the black and white of structural analyses. To do this, I made thirteen interviews with experts (agricultural engineers-technicians) that were/are responsible for agricultural extension (either public or non-public) work and also nine in-depth interviews with farmers by random sampling from various regions of Turkey that are prominent in agricultural production.

Table 5-2: Distribution of semi-depth interviews

<table>
<tr><td colspan="5">Semi-depth interviews</td></tr>
<tr><td rowspan="2">Participants</td><td colspan="3">Gender</td><td rowspan="2">Subtotal</td></tr>
<tr><td colspan="2">Male</td><td>Female</td></tr>
<tr><td>Farmers</td><td colspan="2">(4)
Salih (51, farmer, Edirne)
Orhan (60, farmer, Edirne)
Mahsun (52, farmer, Diyarbakır)
Mehmet (58, farmer, Mersin)</td><td>(5)
Meliha (37, farmer, Çanakkale)
İkbal (66 farmer, Kastamonu)
Nuriye's (62, farmer, Mersin)
Betül (70, farmer, Sakarya)
Vahide (64, farmer,Yalova)</td><td>9</td></tr>
<tr><td rowspan="2">Experts</td><td>Agricultural Engineers</td><td>(10)
Hasan (69, agricultural engineer, Diyarbakır)
Cahit (60, agricultural engineer, Sakarya)
Şükrü (70, agricultural engineer, Ankara)
Mehmet (61, agricultural engineer, Antalya)
Macit (65, agricultural engineer, Konya)
Mustafa (67, agricultural engineer, Adana)
Serhat (74, agricultural engineer, İzmir)
Namık (63, agricultural engineer, Kırklareli)
Nusret (50, agricultural engineer, Edirne)
Kamil (25, agricultural engineer, Edirne)</td><td>(3)
Fatma (52, agricultural engineer, Adana)
Hatice (50 agricultural engineer, Adana)
Bihter (51, agricultural engineer, Adana)</td><td>13</td></tr>
<tr><td>Technicians</td><td>(2)
Hakan (45, agricultural technician, Konya)
Ali (50, agricultural technician, İzmir)</td><td>-</td><td>2</td></tr>
<tr><td></td><td></td><td>12</td><td>3</td><td>15</td></tr>
<tr><td>TOTAL number of participants</td><td colspan="2">16</td><td>8</td><td>24</td></tr>
</table>

A closer look at agricultural extension activities

Farmers get information from many sources and make decisions about agricultural production. On the other hand, the information used in agricultural production is not only related to the farmers' decision but also to the political economy structure. Agricultural production plays an important role in the growth of national economy and become an inseparable part of rural development (Kniivila, 2007:296). Besides being the source of food, it is considered as a part of economic growth based on capital accumulation of growing industries (Akbaş and Bağcı, 2021:106). The fundamental condition to improve national economy is regarded to increase the amount and the efficiency of agricultural production (Okine and Özel, 2018). Thus, countries plan agricultural production in accordance with economy policies to fulfill the requirements of industries and the need for food of growing world population. While acknowledging that the formulation of plans historically changes depending on the political atmosphere, transferring modern agricultural technology and knowledge to farmer has been one of the basic components of development plans (Mejering and Roza, 2007). Herein agricultural extension and advisory services play the role as a bridge that connects farmers with experts (Anandajayasekeram et.al., 2008). The main aim of agricultural extension is to deliver agricultural information to farmers and increase their productive capacity. It is also served as a channel to introduce agricultural policies in terms of delivering best practices to farmers (Umali and Schwartz, 1994: 34). Although the primary focus is delivering information in extension service, they encompass a wide range of modes of operation due to the changes emerged in agricultural policies. In Turkey the main turning point in operation of extension services is reorganization of Ministry's[18] structure in 1984 (Aktaş, 2005:260-277). Before the reorganization, agricultural extension was solely operated publicly by the Ministry at the provincial, district level. After the reorganization which was the result of decentralization of the state and rising neoliberal policies, agricultural extension was partly privatized (Aktaş, 2002). 1980s constituted a turning point in terms of public extension services in Turkey as well as in the rest of the world (Taluğ and Tatlıdil, 1993). Government extension services that were publicly financed have undergone a significant pressure to reduce their expenditure and staff. Public agricultural extension services continued partly but level of public spending for it was cut down. Within the close cooperation with the IMF, the World Bank, the WTO and the EU agricultural value chains were started to be internationalized under control of transnational agribusiness and their domestic partners. Public extension was splinted into a range of public, non-public and private information deliveries. Aktaş (2005) draws the chart of this distinction by mentioning the related establishments and organizations as shown in Figure 1.

[18] The name of the Ministry of Agriculture and Forestry changed several times in the history of Republic of Turkey. Hence I choose to say "the Ministry" unless I don't indicate a specific date.

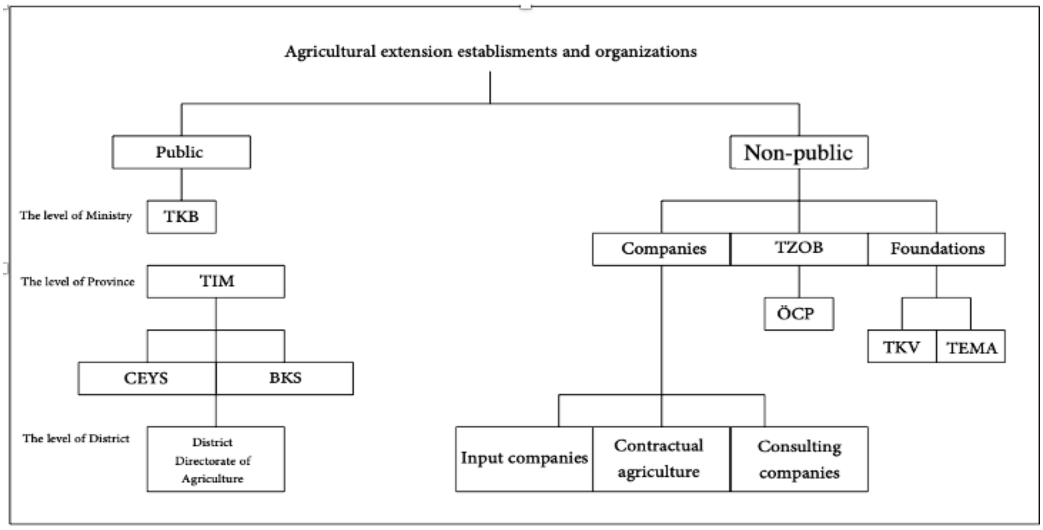


Figure 5-1: Agricultural extension establishments and organizations in Turkey after 1984
Reference: (Aktaş, 2005)

Another particular distinction is emerged in the discourse that define target audience of agricultural extension from farmer as citizen farmer as client. This change shows that the notion of power/knowledge and strategies of resistance are particularly differentiated. I evaluate how power/knowledge is exercised in the relation between farmers and extension agents of public, non-public and private services by considering power is always accompanied by resistance.

5.1. Assessment of power/knowledge in public extension services

Agricultural extension traditionally has referred a work of government employees who are agricultural experts (engineers, technicians) that aims to improve methods of agricultural production of farmers by demonstrating innovations and transferring them useful information (Kazbekov and Qureshi, 2008). As for Turkey, helping farmers to solve their problems was a public service at the time the basis of the national economy was seen as agriculture before 1980s. Aktaş (2005: 264) lists the missions of public extension services respectively as:

- Determining the potential of agricultural production and inventory of the province
- Teaching and disseminating agricultural scientific knowledge and techniques to farmers, making demonstrations
- Preparing all kinds of provincial extension programs, conveying useful information to their own staff and farmers through means such as brochure, handbook, demonstrations, letters
- Researching the problems of farmers to be solved
- To carry out studies that will help the processing and marketing of agricultural products
- To provide necessary data required by rural development projects
- Examining the loan demands of the farmers to be established based on the project

- To detect diseases, pests and weeds in the province and to prepare and implement protection programs
- Developing new business lines in order to increase employment opportunities in villages
- To implement training programs and projects for farmer children and youth with the aim of raising pioneers (the example of 4K project was given in the previous chapter)

Aktaş (2005: 266-267) claims that effective public agricultural extension services are the product of state protectionism. He indicates that the aim of public agricultural extension was primarily improving techniques of all agricultural producers in the light of scientific knowledge and technology without considering the size of agricultural land scale (Aktaş,2005: 266). As shown in Figure 2, he shows the working principle of public agricultural services.

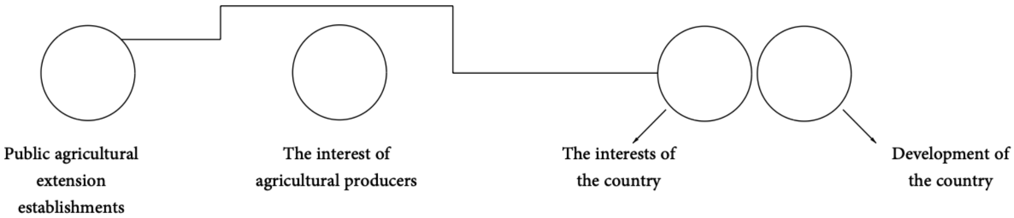


Figure 5-2: The working principle of public agricultural services

The working principle of public agricultural extension is to contribute economic growth of states with boosting agricultural productivity by enabling farmers to raise yields, manage inputs efficiently, adopt new crops and techniques, improve the quality of products in the light of scientific knowledge. It is produced comprehensively in the public research institutes and organizations for the development of the country. In this sense, the following words of Ayhan (68, agricultural engineer, Ankara) are important in terms of revealing the state protectionist understanding in public extension:

> We used to visit villages and transfer modern knowledge to our farmers in order to improve their production techniques. But we didn't count the size of agricultural land. All people living in villages were peasants but if you own a large-scale arable land and manage the agricultural work properly, they call you farmer. But this distinction did not make any sense in case of extension at that time. Everyone who sows and even keen on cultivating might participate our coffee house meetings. We were there to enlighten everyone that listen us. The welfare of the nation was prioritized. The state was everybody's state.

Due to centralized government and state protectionism until 1980s, extension experts (agricultural engineers, technicians) who were working in the public sector were representing the power of state and agricultural modernism, From the words of Ayhan, it can be concluded as they locate themselves in the position of sender and farmers as receiver in transmission of agricultural scientific information. On the other hand, transmission of message to the receiver was not always occurred as requested in the process of communication between with experts and farmers. Farmers and experts have different modes of knowledge systems and approaches to agriculture. Due to this fact, many approaches have developed for modelling communication flow to bring about desirable changes (Van Woerkum, 1999; Windahl et al., 1992). For a considerable amount of time, agricultural extension was regarded as an applied behavioral science and related in issues of technological acceptance models or diffusion of innovations (Leeuwis, 1985). Traditionally scholars in agricultural science focus on complex behavioral patterns of farmers and ask the question “why don’t they do what we want them to do?” (Röling and Engel, 1990:7). The general agricultural extension approach claims that latest scientific and technological innovations exist for farmers but they are not used by them. The concepts “resistance to change” “lack of innovativeness” or “traditionalism” were developed to explain farmers behaviours (Kotler, 1985).

Leeuwis et al. (1985) claim that all behaviorist approaches and the terms coined to explain the process of technology acceptance and adoption primarily focus on what is happening in the interface between extension expert and individual farmer. Cook et al. (2021) criticize behaviorist approaches towards agricultural extension for their *rendering technical*. Li (2007) explains the term rendering technical as reducing complex social relations and their political processes into technical problems which also entails prescriptive technical solutions without considering social structures that have historically subjected. Likewise, Kromah (2016) states that agricultural extension work is highly contextual. Extension is more than communicating with farmer or conveying a specific message. It is embedded within the political economy of agrarian change (Cook et.al. 2021) and shaped by social and cultural factors. Likewise, Kromah (2016) states that agricultural extension work is highly contextual. There are range of power relations and discrepancies in the intersection between farmer and expert (Cook and Zurita, 2019). By rejecting rendering technical, public extension was considered to be treated by taking place and people into account; the communication model of experts and farmers was humanized (Cook et al. 2021). In this regard, Aktaş (1977:23) developed a model that explains the communication dynamics of public agricultural extension in Turkey based on Albrecht’s works (1969) called “Intersystem Agricultural Extension Model”.

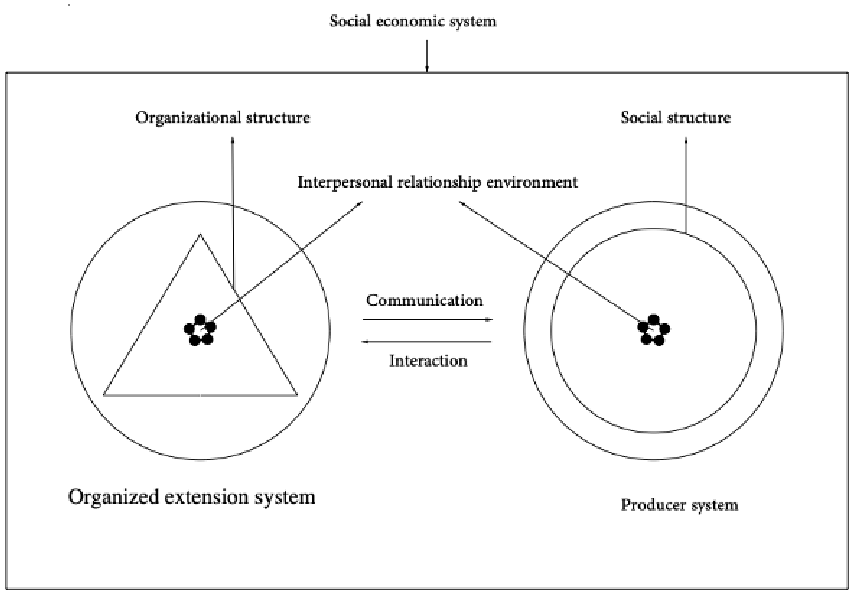


Figure 5-3: Intersystem Agricultural Extension Model- Communication model of public extension

With this model, Aktaş develops an understanding of intersection between farmers and experts in public extension as there are three different systems respectively as farmer system, the organized extension system, and the social-economic system which includes both. According to this model, agricultural extension experts and farmers live in different spheres. This means that states of knowledge, the skills, methods, tools, customs, traditions, beliefs, the approaches towards agricultural production of these two spheres are different. Each individual is in continuous interaction with the other members of their own sphere. The expert and the farmer acting in different spheres communicate to each other with respect to certain intervals. The form of the communication and interaction of these separate spheres is determined by the social economic system. It plays a constitutive role to shape implementation of agricultural extension. Although Aktaş refuses to evaluate agricultural extension services rendering technical and humanizing the communication flow between experts and farmers by taking social, economic and political factors, he does not create rooms to discuss what farmers do with scientific knowledge. It does not focus on how power relations are emerged and how power/knowledge is exercised by farmers. To full this gap, I attempt to evaluate this model in terms of Foucauldian understanding of power by considering opposite forces, strategies of resistance. Foucault argues that power and knowledge are inseparable and that power is diffused throughout society, not centrally concentrated. Foucault also considers resistance as an element inherent to power. In this way, he asserts that resistance is diffused relationally in different forms as such moment of refusal, recalcitrance and unrulines. It is possible to enrich Foucault's idea of resistance with De Certeau’s (1988) tactics

Producer sphere: Tactics against authority of scientific knowledge

In Turkey until 1980s, extension services were administered by state protectionism to foster public interest and delivery programs were centrally planned. There were certain research institutes that worked in coordination with extension departments. Organized extension system was consisted of extension agents such as general directorate and branch offices of extension services of the Ministry and scientific organizations such experiment stations, universities and research institutes. In this sphere, expert officials were pre-trained in the light of findings of scientific researches before visiting villages. After that experts travel to another sphere and try to transmit the messages. In this regard, extension was a supply-driven program, government-controlled, bureaucratic, and top-down. Extension agents were seen as epistemic authorities and interaction might be limitedly emerged in terms of certain feedbacks from farmers. However, Aktaş's definition has lost its validity to some extent with the interviews conducted in the field. Farmers measure the knowledge of engineers with the tactics they have developed, protect their agency in the knowledge transfer process, and provide a certain degree of autonomy through their questioning. This questioning can be explained by De Certeau's conceptualization of tactics. "The Practice of Everyday Life", De Certeau (1988) states that individuals develop a number of everyday tactics against the strategies of power. Through these tactics, as such “ways of language use”, “act of reading” individuals gain achievements through changing, undermining, reorganizing the meanings of the mechanisms that establish power and control, thus preserving their agency, gaining room for manoeuvre, managing power relations to a certain extent, and gaining a certain degree of autonomy. De Certeau states that the ordinary people, through the tactics they use in their daily life practices, to a certain extent, avoid and subvert the effects of power. Farmers' methods of coping with the authority of scientific knowledge can be understood through the understanding of De Certeau’s tactics. During the period when the public extension approach was dominant, when the engineer represented modern knowledge and state authority, farmers developed a number of tactics to maintain their agency in decision-making processes. These tactics enable farmers to maneuver within the sphere of power. One of the most prominent tactics that strengthens the agency of the farmer in public extension is that farmers construct reliability thresholds and question engineers knowledge. Questions that can be seen as an ordinary activity of daily life are a way for the farmer to measure the knowledge of the engineer. Experts were seen as outsiders that are not aware of farmers real needs, language, daily life, traditions and beliefs. Following words of Hasan (69, agricultural engineer, Diyarbakır) is a good example of farmer's need of construction reliability threshold:

> In the 1970s, public agricultural extension was more on the agenda, but at that time, at least in Diyarbakır, the opportunities were limited. Access to the villages was difficult, it was hard to find vehicles to visitvillages. In addition to physical distance, experts might not understand farmer's language. The expert needs to be in constant communication with the farmer, s/he has to prove to him that s/he is the part of farmer's world otherwise he will not listen to the expert. "How could this stranger might know my world better than I do?" he speaks aside."

Hasan's remaining sentences are important to illustrate the function of reliability tests:

> Farming is such an occupation that you understand when you put money in the pocket. Farmer should trust the expert first than may lead his expenses according to expert's guidance. If the expert can pass the reliability test of the farmer and if the recommendations improve his income, the trust bond and the real interaction will be established. Otherwise, they won't listen the expert and follow his guidance.

In the interviews, a certain common ground of farmers emerged for the construction of the reliability threshold and the application of the reliability test. Farmers found that the tool for questioning the authority of scientific knowledge measured the engineer by "misleading" and "asking for what he knows". Cahit (60, agricultural engineer, Sakarya) mentioned that farmers generally showed the resistance of trying a new pesticide as they think it may put the next harvest at risk. He explains the questioning tactic of "misleading" he developed to test the engineer's advice as follows:

> One day I went to one of the villages of Aydın. I was planning to explain methods of agricultural controls towards mildiyö[19]. Before I introduced myself to the village, one of the farmers came next to me and asked me to look the grape leaf in his hand. I had never seen such a disease before. It didn't look like mildiyö. I said I didn't know; this was the first time I had ever seen. He looked me in the eye and said he was glad I didn't lie to him. After our meeting finished, I was getting prepared to return. He came and told me that he pierced the leaf with his cigarette stub to test my credibility."

[19] A plant diease that appears as pale green or yellowish small spots on the leaf.

Following words of Şükrü (70, agricultural engineer, Ankara) also showed the tactic of “misleading” and “asking what is known” and the importance of reliability test in the communication flow between experts and farmers:

> One day, a group of agricultural engineers went to the village of Yozgat to make extension about field crops. They collected the farmers, one of them pointed to his field by stating the sentence “I would like ask you a question about my barley field”. Experts replied that “of course we are listening.” Silent lasts for a while and the farmer responded ‘I forgot my question, it doesn't matter.’ After that experts went to the coffee shop and organized a meeting to inform farmers in the light of latest developments about field crops. While the farmers looked like as they were listening to experts by occasionally shaking their heads not be disgraceful to experts, they were playing *Okey* and sipping their tea. I remember the extension stuff were telling us the farmers’ attitude disappointedly and saying they had felt there was a wall in the coffee house. After a while, we learned the reason of that wall, the field that farmer pointed out as he would like to inquire was a wheat field not barley. Extension stuff somehow did miss this fact. In other words, they could not pass the reliability test. Hence the interaction could not be established.

Likewise, Mehmet (61, agricultural engineer, Antalya) emphasized that the most critical part of transmission of scientific information to a farmer is successfully passing the reliability test and indicates of him as follows:

> Farmers test engineers with the questions which they know the answer. For example, he can show you the plum tree as if it is a walnut, you need to be wide awake. He can create stories like he could open hole by burning in the middle of the leaf with his cigarette and ask the expert what kind of a pest would cause this[20]. If you don’t realize these tests, farmers will not listen to you and follow your instructions.”

I argue that adding the factor of “extension threshold” to the model of Aktaş, contributes creating more room for analyzing the Foucauldian interconnection of power/knowledge in the relationship between experts and farmers. Foucault asserts that power pervasively exists in all social relations and emerged in countless different forms. He shows an intellectual effort to conceptualize power as a complex set of relations that also offers strategies of resistance (Rabinow and Rose,2003). In other words, resistance is always inherent in power, power relations exist with resistance (Foucault, 1998). Foucault’s thinking can be enriched by initiating De Certeau’s understanding of tactics. In case for agricultural extension, it is revealed that “misleading” “asking what is known” are the tactics that farmers follow to questions the authority of scientific knowledge and retain their agency by constructing reliability threshold.

[20] I encounter this tactic many times in the field research in Adana, İzmir, Tarsus,Ankara. I claim that it was a common reliability test that farmers learn from each other.

Another point that catches my attention during my fieldwork was that my interviewees who made agricultural extensions were mostly men. First of all, I thought it was because I could not reach women agricultural extension experts. I was collecting data about how farmers test experts by asking certain questions but I could not find women voice. Later, both from the interviews and the literature, it is revealed that before 1980s in Turkey, there were almost no woman expert delivering agricultural information to farmers. The precondition of public agricultural extension was being man. It was maintained between male civil officials and male farmer as gendered networks of relations (Ragasa, 2014). Women extension experts were specialized in home economics and were responsible to transfer information and techniques related with domestic production to the women of the villages. Even if they graduated from faculty of agriculture, they were allowed to go the villages with their male colleagues and keep quiet in the interaction with male farmers. Women officers interacted with women of the villages in the private space, inside their homes[21] to deliver home economics information such as improving managing complex households and multiple livelihood strategies. The voice of women kept in private sphere. Moreover, it is also important to note that this type of extension was reproduced women's invisible labor in private space and also making invisible their labor in agricultural production. Although they provide a significant agricultural labor, the delivery of expert information was targeted to male farmers. After experts turn back to their "organized extension sphere", male farmers disseminate the knowledge to households in "producer sphere". I argue that producer sphere that Aktaş points was the public space with male dominance. Women were able to receive home economics information in private spheres from women experts and receive information related with agricultural production from men of the house. The patriarchy of state during the times when the state was seen as a "father" due to its protectionism keep the women voice inside the private space. Due to the fact that public agricultural extension as gendered phenomenon, I add the gender factor in communication model between experts and farmers. It shows how power/knowledge based on gender is embedded in the intersection of the spheres/systems that Aktaş conceptualized and how the sphere itself hides unequal power relationships in the construction of public extension.

[21]Extension on home economics would be the topic of an another study. I evaluate it in the framework of how agricultural extension is consisted of gendered actions.

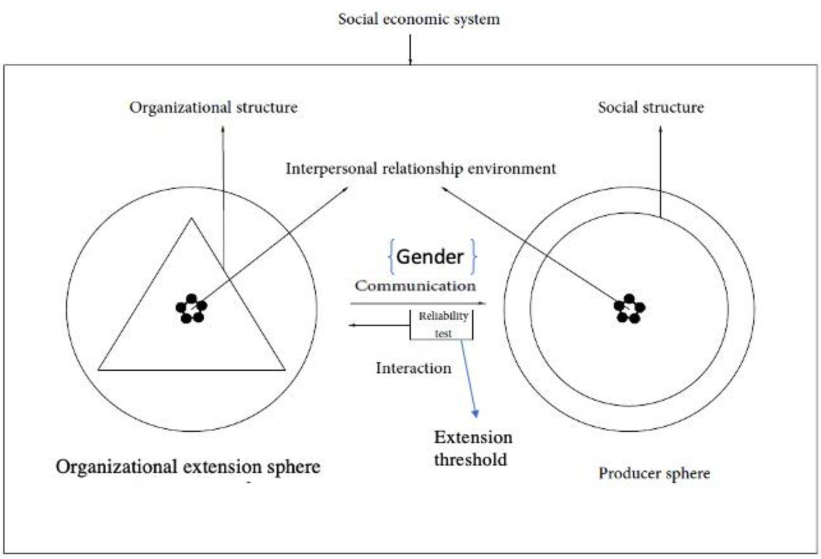


Figure 5-4: The interpretation of Aktaş's Intersystem Agricultural Extension Model according to tactics of farmers

The communicative components of public extension in the model above were historically constructed. Likewise in producer sphere, the organizational changes emerged in extension sphere where scientific knowledge is produced have particular consequences in terms of power/knowledge relations. Thus, I require a detailed consideration of organizational extension sphere analyze how it shapes power/knowledge assessments in agricultural extension.

Organizational extension sphere: How agricultural scientific knowledge is produced and transmitted?

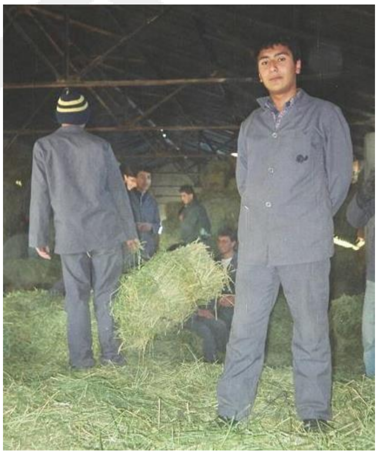
In Aktaş's extension model, the organized extension system is consisted of institutions that produce and disseminate scientific knowledge to farmers. The organizational structure of this sphere was transformed due to particular socio-economic regulations. According to my interviews, literature review and fieldwork, the most important reorganizations in producing agricultural scientific knowledge revealed as affiliating the agricultural vocational high schools from Ministry of Agriculture and Rural Affairs to Ministry of Education, planned obsolescence and closing of TopraksSu. My interviewers pointed out that the transformation of these two establishments created significant results in terms of producing scientific knowledge and its transmission by reorganizing the relation between farmer and expert, in a wider framework in between science and society.

Reorganization of agricultural vocational high schools: The story of stealing pumpkin instead of a melon

Agricultural Vocational High Schools were founded based on the “Regional Agricultural Schools” that had been active in various regions of Turkey since the 1930s. In the 1950s, steps were taken to modernize agriculture with a view to increasing production, and after 1961 focus switched to the main goal of long-term development plans. The significance of vocational training in agriculture, along with the need to develop agricultural infrastructure, to ensure social awareness and to raise qualified personnel, thus became apparent. Addressing this need, formal agricultural education institutions played a critical role in training intermediate staff to conduct extension activities, and to train the children of families living in villages involved in agricultural activities as a labor force, equipping them with the necessary agricultural knowledge and skills. With the transition to the planned period in 1955, “Regional Agricultural Schools” were transformed into “Agricultural Vocational High Schools” (Koç, 1994: 193). These schools were established to train more qualified personnel through practice-based education (Öğretim Müesseleri, 1960: 193). Agricultural Vocational High Schools developed and extent this understanding in a similar way by training the children of village families in the requirements of modern agricultural practice, providing farmers with seedlings, saplings and breeding stock, and providing education and training in production techniques (Cicioğlu, 1985). The approach to education followed in these schools was based on the vision of Mustafa Kemal Atatürk stated during his opening speech in the fifth term of the Turkish Grand National Assembly in its third year: “Agriculture is the basis of the national economy. For this reason, we attach great importance to development in agriculture” (Atatürk Higher Institution of Culture, Language and History, 2006: 224). The photo archives of Gökhan Tarım (50), who graduated from Çumra Agricultural Vocational High School in 1995 and was the school’s photographer, showcase this argument. In the photo, on the back it is written "the basis of the national economy is agriculture."

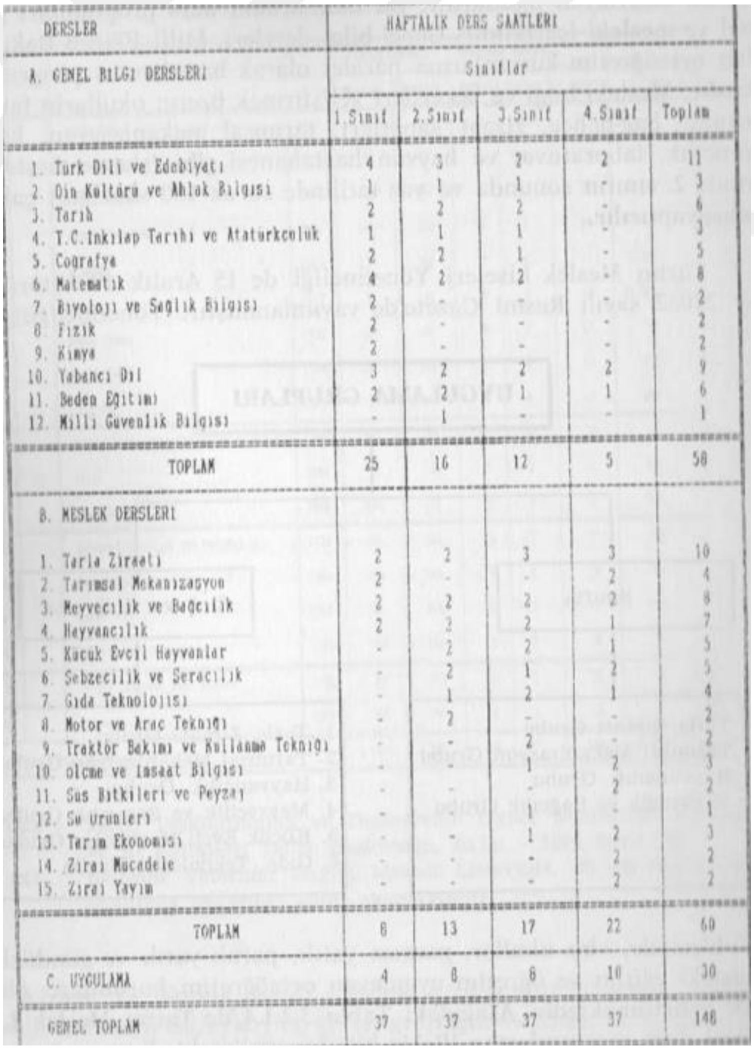
Photograph 5-1: An image inside Çumra’s agricultural vocational high school

The expression of Atatürk that implies the foundation of the national economy is agriculture appears in student photographs. Affiliated to the Ministry of Agriculture and Rural Affairs, these schools provided high school level practical education to students in agricultural applications. They took such courses as field agriculture, vineyard-garden, agricultural arts, agricultural mechanization, animal husbandry and laboratory testing to develop their vocational knowledge and skills, and take part in a 150-hour internship program during the summer. Students gained experience and knowledge in various subjects requiring human involvement, including plant care, birthing, fertilization and harvesting (Agriculture and Rural Foresty Regulation, 1992).



Photograph 5-2/5-3/ 5-4/5-5/5-6/5-7/5-8: Trainings of Çumra Agricultural Vocational High Schools was based on practice
Reference: Gökhan Tarım archive

There were 9 agricultural vocational high schools until 1993 that were administered by the Minisity respectively in Bursa, İstanbul, Manisa, Amasya, Malatya, Van, Konya, Aydın, Çankırı (Koç, 1984: 200). These 9 agricultural vocational high schools listed by Koç were opened to train qualified intermediate staff. In other words, the most important role of these schools is meeting the need for intermediate staff through agricultural extension. Technicians who graduate from these schools develop into intermediate staff who can facilitate dialogue between agricultural engineers and farmers, and who can interact with farmers without facing the difficulties of being outsiders by making use of the experience and knowledge they have gained. I access the curriculum of these schools in 1992 from the archive records of the Ministry. It shows how students were trained both to raise level of literacy and integrated in agricultural production through practices to become qualified intermediate staff in extension.



DERSLER	HAFTALIK DERS SAATLERI				
A. GENEL BILGI DERSLERI	Sınıflar				
	1.Sınıf	2.Sınıf	3.Sınıf	4.Sınıf	Toplam
1. Turk Dili ve Edebiyatı	4	3	2	2	11
2. Din Kultürü ve Ahlak Bilgisi	1	1	1	-	3
3. Tarih	2	2	2	-	6
4. T.C.Inkılap Tarihi ve Ataturkculuk	1	1	1	-	3
5. Cografya	2	2	1	-	5
6. Matematik	4	2	2	-	8
7. Biyoloji ve Sağlık Bilgisi	2	-	-	-	2
8. Fizik	2	-	-	-	2
9. Kimya	2	-	-	-	2
10. Yabancı Dil	3	2	2	2	9
11. Beden Eğitimi	2	2	1	1	6
12. Milli Guvenlik Bilgisi	-	1	-	-	1
TOPLAM	25	16	12	5	58
B. MESLEK DERSLERI					
1. Tarla Ziraati	2	2	3	3	10
2. Tarımsal Mekanizasyon	2	-	-	2	4
3. Meyvecilik ve Bağcılık	2	2	2	2	8
4. Hayvancılık	2	2	2	1	7
5. Kucuk Evcil Hayvanlar	-	2	2	1	5
6. Sebzecilik ve Seracılık	-	2	1	2	5
7. Gıda Teknolojisi	-	1	2	1	4
8. Motor ve Araç Tekniği	-	2	-	-	2
9. Traktor Bakımı ve Kullanma Tekniği	-	-	2	-	2
10. olcme ve insaat Bilgisi	-	-	1	2	3
11. Sus Bitkileri ve Peyzaj	-	-	-	2	2
12. Su urunleri	-	-	1	-	1
13. Tarim Ekonomisi	-	-	1	2	3
14. Zirai Mucadele	-	-	-	2	2
15. Zirai Yayım	-	-	-	2	2
TOPLAM	8	13	17	22	60
C. UYGULAMA	4	8	8	10	30
GENEL TOPLAM	37	37	37	37	148

Photograph 5-9: The curriculum of Agricultural Vocational High Schools

Reference: Archive of International Agricultural Training Center. It shows that vocational courses are consisted of applied courses such as field agriculture, fruit growing, vegetable growing, greenhouse farming.

With this curriculum, the technicians could meld the theoretical knowledge with experience that they gained from practice, internalizing it and turning it into a language that farmers can understand. They can understand the ecosystem and language of both of spheres, and play a critical role in the success of agricultural extension and agricultural development (Tekeli, 2004: 37).

Words of Macit (65), who worked as a teacher at Çumra Agricultural Vocational High School, shed light on the understanding of agricultural education in that period:

> A woman who served in the CHP Women's Branch brought her son to enroll, but I understood that their family was part of high society. I told her not to enroll her son in the school, and explained to her that the students attended animal births, collected animal feces and worked in fields. I told her that it would be difficult for them. She thought I was joking, and said "You don't say!", and had her son enrolled. She returned a week later; her son informed her. She said, "You really send our kids to fields, and use them as field-hands?" I told her that she could move her son to another school. We called him. He was staying at the dormitory, you know, so he was always with us. He said he did not want to go, and argued with his mother. No matter what she said, he would not be persuaded. Now he lives in İzmir. He graduated from our school as a technician and then completed his higher education. He became a very well-equipped agricultural scientist who understand the language of farmer.

The emphasize that Macit makes "understanding the language of farmer" is revealed the education understanding of these schools. In my interviews, there were particular statements such as "Language of farmer" "Farmers think with their eyes" and "Farmers do not believe in anything they do not see, except for God". Technicians from these high schools were able to think, see and speak like a farmer by virtue of functionality of the practical formal training. Hence, they were able to pass the reliability of farmers in the process of extension. The following quote from Hakan (45, agricultural technician, Konya) is evidence that the technicians were able to easily cross the extension threshold and readily accepted in the villages they visited for extension purposes:

> We were raised by peasant families, so we understood their situation. Our training allowed us to understand the common mistakes made in production, and we learned better methods. It was very easy for us to return to where we came from and pass on what we had learned. Those who graduate from normal high schools and enter faculties of agriculture mostly graduate without seeing the soil. For example, after my graduation from the agricultural vocational high school, I enroll the Department of Agricultural Structures and Irrigation of Çukurova University. One day we missed class and decided to go and have a picnic. My friends turned up with a melon they had stolen from a field. They wanted to cut and eat it. I looked at the thing they were holding, and asked 'Is that a melon?' They had stolen a pumpkininstead of a melon. They did not even know what they had stolen: can you believe that? How can you graduate from a department of field

> crops without actually seeing the field and understand what farmers are talking about? During my obligatory national service, I only attended university for exams. I already knew all of the subjects, and most of the time I came first in my exams. We were in the field all the time, working shoulder to shoulder with the farmers. When farmers see dirt on your shoes and animal dung on your boots, they see you as one of them. They need to see that you are one of them to be convinced. That's the only way they will trust what you say to them. After that, it is easy to transmit knowledge and techniques.

Similarly, Mustafa (67, agricultural engineer, Adana) who is the high agricultural engineer emphasizes the importance of intermediate staff in agricultural extension:

> The first-time fertilizers were marketed, no one wanted to use them on their fields. Agricultural engineers would visit each and every village to explain the benefits of fertilizers in terms of yield. I am talking about 1970s. At the time, the state provided fertilizer free-of-charge to farmers through agricultural equipment institution (Zirai Donatım Kurumu). All of those fertilizers were thrown onto the roads next to the fields because no one wanted to use them. The problem was eventually solved by technicians. They somehow persuade the farmers. The farmers saw the increase in yield with their own eyes and came to accept the use of fertilizers, which then became popular.

The following comment from Ali (50, agricultural technician, İzmir) supports the model proposed by Aktaş, suggesting that that the shorter the distance between different spheres, the more positively the extension will be affected: "Technicians were usually affiliated to district agriculture directorates, while agricultural engineers work in provincial agriculture directorates. In other words, technicians worked in the districts, and so were close to the villages. They were intermediate staff, and so were in constant communication with the farmers. They did not come from the center; they were already there."

It was further understood that the intermediate staff sent by institutions that produce scientific knowledge and technology reached the farmers quickly and carefully to pass the extension threshold. Şahin explains this situation as follows: "When the farmers first meet you, they ask questions they already know the answer to. As technicians tend to have been brought up in peasant families, they have a little accent, and give the right answer with this accent since they have been involved in every aspect of agriculture. Therefore, the bond of trust is established instantly." It is understood that technicians became 'enablers' in power relations between farmer and agricultural engineers as they have a good command both of scientific knowledge and knowledge in practice. They worked as translator from scientific knowledge to farmer's language. They were able to pass easily the extension threshold that is constituted by farmers as an opposite force towards epistemic authority of agricultural engineers. They created a transitive gray area in the intersection of the spheres.

On the other hand, it is important to note that only male students could benefit from the free accommodation provided at agricultural vocational high schools. In other words, the human resource equipped with vital agricultural knowledge and skills is a male domain. Under the planned development period, the success in agricultural production growth is also associated with household production. Accordingly, it was emphasized that the socio-economic development of society could not be ensured simply by improving agricultural production, as a certain level of awareness is required also in household production. Thus, "Home Economics Vocational High School" were established under Agriculture and Rural Affairs in 1967 in which only female students could be educated. In those institutions, female students gained knowledge and learned techniques to improve the yield of the special products. They were educated in various fields including handicrafts, food science (fermentation knowledge such as jarring tomato paste, and making cheese, pickles, tarhana, yoghurt), making clothes for the family, and family relations. These schools offered free education and accommodation to students, aiming to educate male students as extension agents to male farmers, and female students who could improve home economics of women in the villages (Yıldırak, 1982). In this case, the public space in which agricultural extension took place was once reproduced as a male dominant space. Female education was limited to domestic production in private space which reproduce gender-based unpaid labor.

Affiliated to the Ministry of Agriculture and Rural Affairs, and providing their students with practical training, these schools were transferred under the Ministry of National Education with a protocol enacted in 2004. Under Decree Law No. 441 (11/f) on the organization and duties of the Ministry of Agriculture and Rural Affairs, agricultural education and training services were brought under the control of the General Directorate of Organization and Support (Kaynakçı and Boz, 2000). After this handover and re-organization, practical courses in schools were mostly closed, to be replaced by culture-oriented courses such as physics, chemistry and geography. Describing the severe effects of this transformation, the following comment from Macit (65, agricultural engineer, Konya) is significant:

> Today, all sectors are in need of qualified intermediate staff, and this is the case also for agriculture. With the enactment of this protocol, the schools that had once trained technicians with practical knowledge and who not only read books, but also did physical work, became obsolete. It was a huge mistake to separate the agriculture schools from the Ministry of Agriculture. The curriculum was changed, and they started teaching subjects based on books. That protocol is the reason why we have an intermediate staff problem in agriculture right now.

The 2004 protocol, however, was not the only reason for the obsolescence of the institutions that produced scientific knowledge and had successfully applied agricultural extension activities and transferred knowledge and technology. The changes of ToprakSu General Directorate, an organization that conducted research and development projects related to Turkey's agricultural production infrastructure were frequently mentioned by the interviewees with its effects on agricultural extension.

Reorganization of general directorate of ToprakSu: Investments from underneath the soil to above-ground

As mentioned above, the planned development mentality of 1960s was focused on agricultural production growth. Problems such as aridity and drainage resulting from the lack of knowledge of irrigation were on the agenda those years. Taking advantage of the water sourced from the irrigation networks established by the Ministry of Public Works in 1940s, the farmers used water blindly, leading to significant problems on the agricultural lands. Problems of salinity and aridity were observed in the irrigated fields, creating a need to focus more on agricultural land infrastructures and to share the acquired knowledge with farmers. It is clear that the necessary understanding of the problems of soil and water, as key components in agriculture, was lacking. Accordingly, The General Directorate of ToprakSu was established on February 27, 1960 with the responsibility to manage soil and water resources in the most productive way possible. 11 research institutes were established under the general directorate of ToprakSu in the cities respectively as Ankara, Tarsus, Menemen, Eskişehir, Konya, Tokat, Samsun, Şanlıurfa, Erzurum and Kırklareli. The services provided by this directorate, which were referred to as agricultural investments, can be listed as follows (ToprakSu General Directorate, n.d.):

- Conservation of soil productivity, land development, research into all aspects of agricultural irrigation, and the provision of education, training and technical support based on the acquired knowledge.
- Informing farmers and providing them with technical support in soil analyses.
- Testing soils for productivity, irrigation and drainage capabilities
- Preventing erosion in arable soils, and avoiding possible harm by flood waters
- Developing and restoring lands with regards to the management of ToprakSu, and establishing the necessary facilities

Considering the duties listed above, I argue that in Turkey's agricultural history, the General Directorate of ToprakSu was one of the most component establishments that is able to regulate the relationship between soil, water, plants and humans. The

Directorate was divided into seven different branches that made their plans based on reliable specific data respectively as Hydrological Research, Soil and Water Conservation, Irrigation and Soil Physics, Drainage and Development of Arid Soils, Agricultural Mechanization, Economics, Business and Statistics Studies, Plant Cultivation and Nutrition and Soil Productivity (The Ministry of Rural Affairs and Cooperatives,1980).

Photograph 5-10/5-11: The entrance of TOPRAKSU in Kırklareli / Engineers of TOPRAKSU were delivering the information about irrigation techniques

Reference: Retrieved from Erol Özkan archieve

Serhat (74, agricultural engineer, İzmir) who worked in the General Directorate of ToprakSu in Tokat evaluated the understanding of national development in the period of ToprakSu in the sense of the value given to agricultural knowledge as follows:

> In the 1970s, Turkey was known as an agricultural country. At the time, people believed that agriculture was the foundation of the national economy. All qualified young people in the country wanted to study agriculture. Can you imagine a better field than medicine? ToprakSu Institute had great appeal for young people as it was engaged in R&D projects. It was a thrilling organization for young people back then. The demand was high. I also preferred to enroll agricultural faculty instead of medicine. R&D projects of ToprakSu were long-term, and involved the collection of data for the in-farm investment service. Sometimes it was hard to explain this to farmers, especially when talking about drainage or agricultural product cost optimization. We had hard times, but there were also times when we provided direct assistance to farmers. For example, we carried out soil analyses and provided them with direction, free of-charge, allowing them to use the correct fertilizers in appropriate quantities. We also provided them with guidance in irrigation. The farmers benefited greatly from this.

Namık (63, agricultural engineer, Kırklareli) who worked in Atatürk ToprakSu Research Institute also mentioned that farmers mostly had little interest towards long term R&D studies of ToprakSu. Words of him shows how research and development studies were seen by farmers and how power/knowledge is exercised in the intersection of the spheres:

> Our job involved conducting soil analyses, free-of-charge, and guiding farmers in the best use of soil and water resources. Yet we had other tasks such as being engaged in R&D projects on land consolidation, precipitation regime maps, natural air rehabilitation, stepping, irrigation pond creation, soil inventories and terracing. Most farmers had little interest in the ToprakSu studies because we were dealing with the long-term effects of long-term data, but with focus on what was underneath the soil and water, which farmers eye could not see. Extension was easier for other research institutes. Think about, for example, explaining how you improve sunflower yield. It is easy. You go, show and demonstrate, and prove the yield. Looking at it from a farmer's point of view, you get tangible results in a short amount of time. What we did was to create investment data related to infrastructure. For example, we carried out monitoring studies and collected data for 25 years related to an irrigation reservoir in a basin. All of these meant nothing for the farmers in their daily lives. One day, hydrologists set up precipitation and current measuring devices in a field and erected fences around them. Upon seeing this equipment, the shepherds demolished the fences, broke the tools and stole some of the equipment. When we asked them why they break, their response was 'because of curiosity.

In addition to this, Serhat (74, agricultural engineer, İzmir) explained what they had to go through when they were required to collect periodical data from farmers for a scientific study focusing on agricultural product costs:

> We had our logbooks for the calculation of agricultural product costs. We asked the head farmer in the village various questions, such as 'What seasonal tasks did you perform?' 'How much time did it take?' 'What was your salary?' 'How much did you pay?' We wanted them to answer agricultural production related questions and fill the log books. We placed brochures containing the latest scientific information in the logbooks. We showed them the brochures and explained their content, and asked them to read the brochures from time to time. At the end of the season, we visited the villages to collect the logbooks, and saw that not one page of the brochure had been touched. Sometimes all our hard work blew up in our faces. At that time, we saw that the head farmer had written nothing in the logbook, even though he said he was filling it when we reminded him. Sometimes they would try to fill the logbook just before w arrived, and act like they had kept it up to date. At those times, all our work went straight into the trashcan. To avoid things like this happening again, most of the time we carried out our field visits together with the technicians. Extension was not our main duty, we were responsible to provide information to the extension staff. When we needed periodical information for our researches we asked the technicians for help, because they had a better interaction with the farmers.

Both Dursun's and Erol's words show that farmers have difficulties in getting involved in research and development in agriculture, and that both spheres have difficulties in understanding each other. At this point, it has been revealed that agricultural technicians work like translators. This intermediate staff, which gathers information from the farmers for the engineers, brings the knowledge of the engineer to the farmer and improves his soil and water management, has a critical importance in the dissemination of agricultural knowledge. When agricultural engineers needed to collect information from farmers for their scientific research and R&D studies they sought help from agricultural vocational high school graduate technicians, who served as facilitators. In Foucauldian words, it can be concluded that power/knowledge take various dimensions and forms in the relationship between the expert and the farmer, and that neither party holds absolute power.

The obsolescence of the General Directorate of TopraksSu occurred in two stages. First, the Ministry of Rural Affairs and Cooperatives was re-organized in 1984 as part of the agricultural reforms, and became known as the Ministry of Agriculture, Forestry and Rural Affairs. This re-organization was the start of the state's withdrawal of its protective hand from agriculture, and January 24 decisions, established a path for neoliberal policies in agriculture (Öztürk et.al.2008). This re-organization significantly damaged the relationship between the Ministry and the farmers in terms of the public administration of agriculture. As part of the reforms, the Directorates of TopraksSu, Road, Water and Electricity, and Land Settlement were gathered under the same roof to become the General Directorate of Rural Services. Such departments as those involved in livestock development and agricultural control were closed, while other units, including the Meat and Fish Institution and the Agricultural Equipment Institution were privatized. Affiliated to the General Directorate of Rural Services, certain research institute departments were merged. Seven research units that were once affiliated to the General Directorate of TopraksSu were collected under three separate groups, namely water, soil and investment management. Then in 2005, the General Directorate of Rural Services was closed and their research institutes were transferred to the İstanbul and Kocaeli Metropolitan Municipalities, and to the Provincial Special Administrations in other cities. Following this transformation, the researches that were first conducted under the General Directorate of TopraksSu were forced into the background. The harm that this transformation brought to the production of agricultural and scientific knowledge is explained by Erol:

> I think we should divide agricultural services into two bodies: pre- and post-1980 period, under and above ground. As the General Directorate of TopraksSu we focused on what was underneath the ground. After the merger, especially when the institutes were affiliated to the s Provincial State Administrations in 2005, agricultural services shifted to above-ground. As a result, building wide roads in villages, donating heep and bee hives to farmers gained prominence, as such services guaranteed the votes of farmers. Farmer eyes should see, otherwise they don't understand. We no longer have access to the hig quality scientific studies that were once conducted by the General Directorate of TopraksSu. Today, one cannot help but wonder which scientific researches are conveyed by what means, and with what effects.


Photograph 5-12/5-13: Agricultural engineers of TopraKSu were conducting research studies related with underneath the ground such as collecting soil inventory data and delivering the information to the farmers

Reference: Erol Özkan archieve

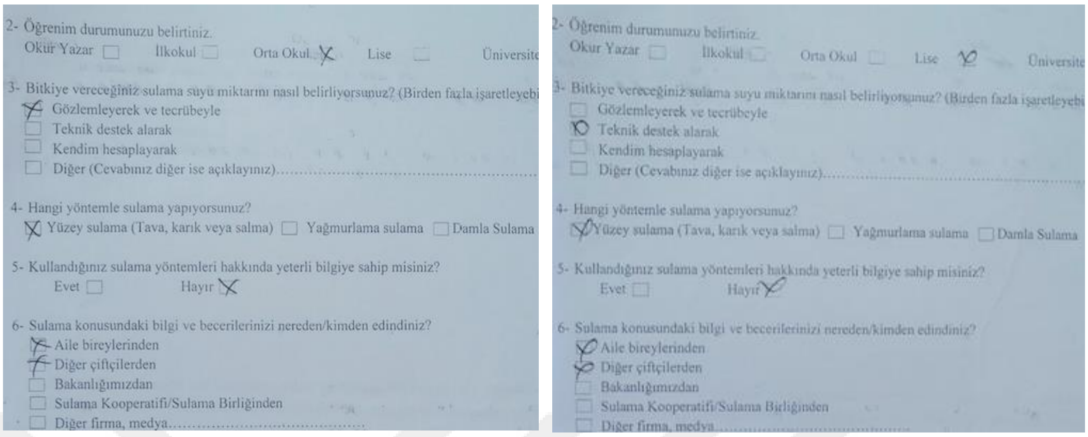
These words of Erol are of great significance when assessing the current situation in the provision of public agricultural extension services, the circle of influence of which has shrunk due to the re-organizations made in 1984 as part of the privatization efforts. Today, extension services are provided by the Department of Education and Publications affiliated to the Ministry of Agriculture and Forestry, with support provided by provincial and district organizations. Fatma (52, agricultural engineer, Adana) who carries out extension studies in Adana, explained how weak today's public agricultural extension practices are:

> Today agricultural engineers have turned into desk clerks. There is a lot of paperwork involved in organizing support items, arranging applications in the Farmer Registration System, etc. and we are drowning under this abundance of paperwork. With all these tasks to do, it has become really hard for us to visit villages for extension purposes. Actually, this is not really required from us. One of our friends, for example, answered a request from a village and visited them in the field during business hours, and an investigation was opened into why they had left their desk. After seeing this, other colleagues have developed cold feet about extension and village visits.

According to Hatice (50 agricultural engineer, Adana) public extension activities are still being conducted, even today, but she explains its effects with the following words:

> Today, students in the faculties of agriculture have no opportunity to witness working with soil. Everything is on paper, and as a result students learn everything theoretically, while the extension phase becomes problematic. Farmers argue that they are already in the business, and they believe there is nothing they can learn from us since we work at our desks. You can sense this even by looking into their eyes. They trust their neighboring farmers, families, friends, agricultural product salesmen and Facebook groups more than they trust us. Unfortunately, this is the situation. We can see this when we look at the surveys focusing on the sources of knowledge of farmers.

As can be seen below, and understood from the surveys conducted by the district directorates of agriculture, when they encounter a problem, farmers tend to use their own methods or consult their friends and other farmers.


2- Öğrenim durumunuzu belirtiniz.
Okur Yazar ☐ İlkokul ☐ Orta Okul ☒ Lise ☐ Üniversite
3- Bitkiye vereceğiniz sulama suyu miktarını nasıl belirliyorsunuz? (Birden fazla işaretleyebi
☒ Gözlemleyerek ve tecrübeyle
☐ Teknik destek alarak
☐ Kendim hesaplayarak
☐ Diğer (Cevabınız diğer ise açıklayınız)..............................
4- Hangi yöntemle sulama yapıyorsunuz?
☒ Yüzey sulama (Tava, karık veya salma) ☐ Yağmurlama sulama ☐ Damla Sulama
5- Kullandığınız sulama yöntemleri hakkında yeterli bilgiye sahip misiniz?
Evet ☐ Hayır ☒
6- Sulama konusundaki bilgi ve becerilerinizi nereden/kimden edindiniz?
☒ Aile bireylerinden
☒ Diğer çiftçilerden
☐ Bakanlığımızdan
☐ Sulama Kooperatifi/Sulama Birliğinden
☐ Diğer firma, medya..............................

2- Öğrenim durumunuzu belirtiniz.
Okur Yazar ☐ İlkokul ☐ Orta Okul ☐ Lise ☒ Üniversite
3- Bitkiye vereceğiniz sulama suyu miktarını nasıl belirliyorsunuz? (Birden fazla işaretleyebi
☐ Gözlemleyerek ve tecrübeyle
☒ Teknik destek alarak
☐ Kendim hesaplayarak
☐ Diğer (Cevabınız diğer ise açıklayınız)..............................
4- Hangi yöntemle sulama yapıyorsunuz?
☒ Yüzey sulama (Tava, karık veya salma) ☐ Yağmurlama sulama ☐ Damla Sulama
5- Kullandığınız sulama yöntemleri hakkında yeterli bilgiye sahip misiniz?
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6- Sulama konusundaki bilgi ve becerilerinizi nereden/kimden edindiniz?
☒ Aile bireylerinden
☒ Diğer çiftçilerden
☐ Bakanlığımızdan
☐ Sulama Kooperatifi/Sulama Birliğinden
☐ Diğer firma, medya..............................

Photograph 5-14: Surveys from district directorates of Ministry in Adana

Bihter (51, agricultural engineer, Adana) on the other hand emphasizes mobile phone-based digital extension and explains how information and communication technologies have transformed the communication between extension experts and farmers today:

> We have staff from district organizations who visit villages and carry out extension tasks face-to-face. Today every farmer has a smartphone. We send SMSs providing farmers with information and posting such information on Facebook. Most of the time farmers turn to the Internet for answers. As the Ministry of Agriculture and Forestry, we have established a free-of-charge digital academy called Agriculture and Forest Academy (Tarım Orman Akademi) for those who want to be kept informed online. We have digitized farmer training. All farmers can enroll and access the training free-of-charge, regardless of where they are."

Photograph 5-15: Some training modules of Agriculture and Forestry Academy

In conclusion, I approach transmitting agricultural scientific knowledge and technology from experts to farmers in a Foucauldian understanding of power/knowledge. By considering Foucault's argument power is relational and entails certain kinds of resistances, I focus on extension practices where experts and farmers developed certain kinds of relationships. The turning point of extension services of Turkey is emerged in 1984 whereby the reorganization of the Ministry due to neoliberal politics. Before the reorganization of the Ministry in 1984, public agricultural extension was based on state protectionism and agricultural engineers who worked at provincial and district directorate of the Ministry were posited as epistemic authorities representing the state. After 1984 with the decentralization of state, private sector entered the extension works and divided it into different categories. I evaluate power/knowledge relations separately in public and private extension. To construct a framework of public extension I utilize the model called "Intersystem Agricultural Extension Model" which was developed by Aktaş (1977) to explain communication flow of public extension. I made contributions to the model to create room for Foucauldian way of analysis of power/knowledge relation. To do this, I evaluate the spheres of "organized extension system" and "producer system" both separately and together in the intersections of them.

In the relation between farmers and experts, different kinds of power/knowledge exercises and strategies of resistances are emerged. There is a threshold called reliability test that farmers developed as a tactic to form certain kind of opposite force against epistemic authority of extension experts. On the other hand, to cope with opposite forces that farmers developed, agricultural engineers utilize the technicians that were graduated from agricultural vocational high schools. In Foucauldian sense, in the relation between farmers and experts power emerges out of relationship within situations. The notion of power/knowledge flows multidimensionally by including opposite forces in public extension. Secondly, I focus after 1984 and evaluate how power/knowledge is exercised in non-public extension services.

5.2. Assessment of non-public extension services

After the reorganization of Ministry of Agriculture, Forestry and Rural Affairs in 1984, the understanding of agricultural extension has changed. Agricultural extension service was splinted into categories as public and non-public. Although -it partly stayed as a public goods that is accessed at free of cost, the private sector was allowed to enter into agricultural extension (Harter and Hass, 1992). After 1984, the provision of agricultural extension service in Turkey become a double-barreled concept with respect to sources of delivery and financing either coming from public or private sector. Non-public extension delivery in Turkey can be broadly categorized into private companies, Union of Chambers of Agriculture and Foundations (See Figure 1).

Especially with the funding of World Bank related with aid and extension for developing countries, the extension services started moving from a supply-driven approach with the government as the sole provider of funds and advices to pluralistic demand-driven strategy (Vonk, 1990). The participatory approach that World Bank tried to initiate resulted in partly withdrawal of state in provision of extension. Public reorganized into profit or non-profit organizations that were independent to some degree and -gradually increasing- share of their income through the market (Leeuwis, 2006). The approach was essentially based on ascertaining the farmer as a participant and cost-sharing agent in extension. It was claimed that by coordinating the respective roles of public and private sectors, several forms of extension would be emerged and all farmers would access to some form of extension public or private through the agents or mass/new media channels (Leeuwis, 2000a). With neoliberal understandings of entrepreneurialism, the emphasis of "individualism" and "autonomy" were attached to farmers by putting emphasis on participation and farmers unique needs (Forney and Stock, 2014). Leeuwis (2006) states that privatization of extension services created a client friendly "knowledge market" that include more demand driven agricultural extension provision and less top-down paternalistic patterns. On the other hand, dismantling public extension services did not automatically indicate that commercial relations have reached absolute power to subordinate farmers due to transferring knowledge and technology. As mentioned above, there are different articulations of resistances, tactics and strategies for oppositional forces in the practice of power/knowledge between farmers as clients, non-public extension services. Below I will explain power/knowledge exercises in private and non-public extension services in terms of samples that I did fieldwork. I start with private category by taking technology-oriented companies as the sample and then continue with non-public category by taking Piooner Farmer Advocacy Assocation (Önder Çiftçi Danışmanlık Derneği) as the sample. While evaluating the Piooner Farmer Project (Önder Çiftçi Projesi-ÖÇP) I made comparative analysis with its public versions KÖY-MER and TARGEL projects. Such a compare and contrast analysis help me to find proper approach in agricultural extension system of Turkey.

Private extension services: Farmer as client

Private extension services can be listed as inter/national input companies, inter/national companies that work with contract farming and private consulting services (Ulrike and Schwartz, 2014). It is important to note that in private extension, farmers are seen as clients (Ozor, 2010). The motivation of the companies in launching extension work is making result demonstration of their inputs to their clientele to maximize return (Uddin, 2013: 479). In the process of generating and transferring technology and knowledge, companies primarily put increasing the profit in their agenda. Aktaş (2005) showed the working principle of private companies as shown in Figure 5:

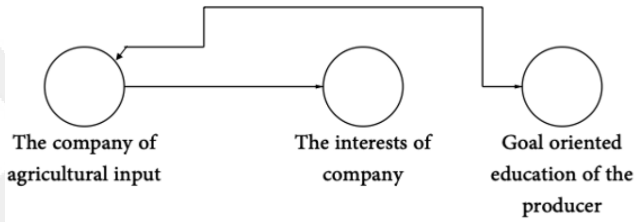

Figure 5-5: The working principle of public extension services

In 1996 in accordance with the regulation no. 23336 the graduates of the Faculty of Agriculture, from Plant Protection Department or took Plant Protection course, agricultural technicians who worked in agricultural control services for three years were given the opportunity to open input dealers (Aktaş, 2005). Agricultural pesticide and fertilizer dealers deliver and sell agricultural inputs that they buy from wholesalers based on farmers' demand. Providing advisory service is not included in their job definition. Torun (2013: 726) states that since the number of extension experts were taken out of the field due to the reorganization of Ministry in 1984, a vacancy raised between dealers and clientele in terms of transferring knowledge. To fill this vacancy, non-public actors started to conduct "extension services". Farmers require implicit advisory services to apply agricultural inputs properly and gain more efficiency in the production. In the relation between dealers and customers, the role of state is regulating license of the inputs as per the "Law on Agricultural Pest Control and Agricultural Quarantine" and "Regulation on Licensing of Plant Protection Products" (ibid:728). The content and the method of advisory services provided by dealers to farmers are non-regulated. With growth in private sector participation is continuing in extension services, nongovernmental organization also has been involved in (Umali and Schwartz, 1994). Non-public form of extension includes non-governmental (NGOs) organizations such as foundations, associations and new types of linkages among public-private and non-governmental sectors (Amanor and Farrington, 1991). NGOs might deliver agricultural information directly to their members or might choose to offer trainings and advisories other NGOs or individual or a group as well. In Turkey one of the most important examples that conduct non-public extension is The Piooner Farmer Advocacy Association (Önder Çiftçi Danışmanlık Derneği) which is a farmer association that is organized around advocacy.

The piooner farmer advocacy assocation: Saving farmer from peasantry

Farmer's assocations are organized in terms certain agricultural fuctions such as input supply, production, advocacy, stock or credit (Ulrike and Schwartz,1994). The main of The Piooner Farmer Advocacy Assocation is delivering information to farmers in terms of improving agricultural production with trainings and advocacy to its members. It also sustains extension services to other NGOs and individuals. With the spread of non-public extension services in Turkey after the organization of 1984, the founding law of the Chambers of Agriculture related to farmer education was put at the top of the agenda. In this law, there is statement expresses that it is a mandatory duty of Agricultural Chambers to organize agriculture courses, winter classrooms and conferences in order to provide practical information to the farmer; to encourage agricultural education (Aktaş, 2005; Ceylan, 2005). Agricultural consultancy services of the Union of Chambers of Agriculture of Turkey (TZOB) were started in 27 December 1986 by Piooner Farmer Project (ÖÇP)[22] in accordance with the international agreement between the Republic of Turkey and the Federal Republic of Germany in 1986 (Arap, 2016). The Pioneer Farmer Project was initiated under the coordination of the Union of Chambers of Agriculture of Turkey and the German Agricultural Union (DLG)[23]. The aim of this project was to adapt the knowledge and technology accumulated in Germany to Turkey with the German agricultural extension model (Anonymous, 2005).

Public withdrawal from advisory services in Germany was expected to emergence of efficient private advisory providers leading more demand-driven advice

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[22] The Pionner Farmer Advocacy Association is abbreviated as ÖÇP as it is based on the project of Piooner Farmer. I will use the abbrevation ÖÇP.
[23] The name of the institution was change to "Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH" in 1991.

and to improve the allocation of resources (Labarthe and Laurent 2013). In this point of view Chambers of Agriculture and German Agricultural Union developed an understanding of agricultural extension in after privatization building the system on advice circles called *Ringberatung* and enterprise working groups called *Betriebsleiterarbeitskreise* (Hoffman et.al., 2000). Advice circle is consisted of advisors, members that are farmers with similar enterprises and similar problems, an accountant, and a vehicle. Accountant is responsible for regulations and organization of fees. Members must pay a fee in terms of the services of extension agents. In exchange, farmers receive the analysis of their farm, new information and techniques related with production and marketing (Lanz, 1993). Advisers drive to every field of members regularly and conducted research and development projects together in the fields with farmers by generating working groups. The model was based on disseminating knowledge and technology through circles that are based on the continuous interaction between advisor and farmers mainly dependent on the specialization, content and intensity of advice (Lanz, 1993). These circles are complementary to the public extension services. The Federal Republic of Germany finance %50 costs involved staff and resource costs. Yet over the years the amount of subsidy has tended to decline.

Trakya was chosen as the pilot region of the project. The first visit of German agricultural engineers took place in 1987. German agricultural engineers, agricultural engineers and large-scale farmers who are open to innovation from the center of Trakya were included in the working groups (Karlı,2001). Mehmet (61) who is the president of ÖÇP today expresses the trainings of German system as follows: "German engineers was conveying the related information with pictures and presentations. Later they make demonstrations to us. They know that farmers must see with his eyes and feel with his hand. After each training, we realized a need what we should have realized before." The main principle of working groups and advice circles of German system is establishing self-help techniques in farmers' world of thought (Hoffman et.al., 2000). The system required the agricultural engineer to be in constant communication with the farmer. Also, the system sees farmer as an individual who need to pay for the information (ibid: 6). It is thought that when the farmer pays, he better understands the value of the information. Orhan (60, farmer, Edirne) who is a farmer and current president of ÖÇP had participated in the first working group in 1987 and got the training of German agricultural engineers organized. He mentions the trainings as follows: “Germans were trying to implement the training and visit system. In the trainings, they were emphasizing that advisors’ hands need to be on farmers anytime. They provide us vehicles in the accordance with the idea that advisors should frequently visit farmers and organize field trips.”

Likewise, Nusret (50, agricultural engineer, Edirne) who is the board member of ÖÇP expresses the understanding of extension as follows:

> German trainers were claiming that farmers need to pay the price of information. Otherwise, they wouldn’t listen or effectively participate in extension services. Also, it was mostly emphasized that the star of working groups is the advisor. The more he is interactive with farmers, the more scientific knowledge and technology transfer takes place. Extension agents either in provincial or district directorate of agriculture organized field trips when a problem arises. Yet in our understanding that were cultivated by Germans the interaction needs to be continuous. Before the emergence of disease in plants, advisors need to be there. Advisors in our approach make the farmer aware of the needs that he is not aware of and provide him with guidance on what he should do to meet these needs. Many public or non-public services works to stop bleeding of a wound, we are working to eliminate the reasons that cause the wound.

Salih (51, farmer, Edirne) also gave an example about farmers being self-aware in terms of soil analysis as follows:

> My grandparents have been farming for generations. We know how important soil analysis is. I received a lot of service from them during ToprakSu time. But at this point, it is very important for the farmer to be conscious. For example, Kamil in the village does not say suddenly ‘I should go and make a soil analysis before fertilization’ If he goes to ToprakSu he can get it done. Today this institution was already closed. The difference of Advisors of Pioneer Farmer is creating awareness in the farmers towards their need. Our advisors tell farmers that they need soil analysis before fertilization. Creating this awareness is a big deal. We are trying to save farmers from the peasantry.

During the conversation, Salih remembered how hard he had worked to get his uncles to buy a tractor by saying “I barely convinced them to buy a 65-horsepower tractor. They said they don’t need it, manpower is enough. When qualified man started to go to Germany as workers, my uncles were convinced to buy a tractor. They saw the benefits immediately and bought four 100 horsepower tractors the following year.”

Nusret (50, agricultural engineer, Edirne) also mentioned how he has been putting efforts to plow fields by introducing the techniques of leaving traces with tractors:

> It was scientifically proved that plowing fields by leaving traces with tractors helps to minimize the cost of inputs and fertilizers. We learned this information in an international fair that we attended. It prevents farmers to apply multiple times of input. The basic logic is to leave certain rows empty while planting for example wheat and to allow the tractor to walk to the field through those empty rows. Also, when the wheat grows, the tractor’s wheel crushes it, due to this crush farmers already can’t harvest certain rows. But if the rows are determined from the beginning, both seeds, pesticides

> and fertilizers are saved. We made the test application and realized it significantly increases efficiency of the production. In the meeting we share the results to our members, after we demonstrate them how to leave the traces properly. In the beginning, it was too hard to convince farmer to leave a particular row and leave it blank without sowing. They had a hard time accepting not to cultivate some of the land.

While Nusret was speaking, Orhan intervened and said “I was one of the first to try leaving traces. Seeing that I did not sow some parts of the land, the villagers complained to my grandfather about me by saying your boy is doing his job disregardful. I had hard time to convince my grandfather that this is the way of increasing the efficiency.” Nusret continued as follows:

> Today most of our members learned the technique and increase the efficiency. Last year I had visited an agricultural company whose owners are highbrow. I realized that they are cultivating the land without leaving traces. I said that it such a traditional production technique does not suit such people. I explaine the methods of leaving traces. They respond by saying ‘leaving the soil without sowing in certain rows? They laugh at us here. Even it is true, socially it is impossible.’ I realized that because of the effects of Pioneer Farmer Association, Trakya become a region consisted of open-minded farmers. I recognize it is harder to save farmers from peasantry in center Anatolia.

The statement of “saving farmers from peasantry” is implies being open to technology and information and having high financial literacy. It also implies developing awareness of using the benefits of scientific knowledge in agricultural production. The use of the word “peasantry” is pejorative that implies it is a situation that farmers need to be saved. Kamil (25, agricultural engineer, Edirne) who has been working as advisor in ÖÇP explains this statement as: “Farmers see agriculture as a profession and but peasants see agricultural production as a work. We claim that agricultural production is a serious profession and needs to be planned in the light of scientific knowledge and technology. We create this ecosystem with our members.” With the statements below, he asserts how they put efforts to increase the level of consciousness of farmers within the participatory approach of the association:

> We visit international fairs with our members. We observe the new products and technologies and apply some them in members' lands. We make researches about the new products be it a seed, an input or a machine for three years. At the end of three years, we share the results of our research with our members. As we are always in contact with our members, they rely on our recommendations. We constantly interact face-to-face with farmers. They know that we will not leave them alone at any stage.

For a period of six years from the beginning of ÖÇP project, all associations, material and equipment need, training of consultants both in Turkey and abroad, and the monthly current expenses of the associations were fully covered by the German Government (Aktaş, 2005). With the end of the project in 1996, the financial aid of the German Government ended. In 1999 working groups and advice circles become

Advisory Association of Pioneer Farmer and farmers have started to contribute 50 percent to the expenditures (Ozer, 2005). Until 2004, the other 50% was supported by state through the Union of Chambers of Agriculture of Turkey. State subsidies were cut in 2004 and all of the association's expenses began to be covered by donations and monthly fee contributions of members (Anonymous, 2011). After this total withdrawal decision of the state, spokesman of ÖÇP and the members visited the Branch Office of Agricultural Extension of the Ministry. Nusret expressed the response he received from the president of the office after a 45-minute presentation to the by saying:

> After I finish the presentation by emphasizing how state support is important for ÖÇP's survival how ÖÇP play a critical role to improve agricultural production techniques, the president says (he is attended from Meat and Fish Organization and does not know either the notion of agriculture or extension) 'This is the first time I've heard what you're presenting us. Very interesting. You've done great things. Congratulations. In terms of state support, political power is needed, I can't do anything.' After that moment, ÖÇP does not expect anything from government.

He expressed that government was following working principles of ÖÇP and generated some projects by taking manner of work as example. He gave the examples of KÖY-MER and TARGEL which are the projects of Ministry while comparing the results of them with ÖÇP. I claim that to create a farmer driven knowledge management model, scopes and results of these particular projects needs to be analyzed. Before continuing today's structure of ÖÇP towards digital agriculture, I find important to analyze the historical process and results of these project of the Ministry.

KÖY-MER and TARGEL projects: Appointing agricultural engineers to villages

In 2004, in the year government cut the aid to association's extension work, the project "Support Project of Rural Area Oriented Agricultural Production" "Köy Merkezli Tarımsal Üretime Destek Projesi (KÖY-MER) was implemented by the Ministry. The aim of this project is to shorten the distance between agricultural engineers and farmers. It was emphasized that generating an interactive environment should be the precondition of the extension and extension agents need to close to farmer physically as well. In 2004 there were agricultural engineers waiting to be appointed, engineers that were graduated from universities were in the cities. By making the call "1000 agricultural volunteers in 1000 villages" the Ministry centrally appointed engineers among the applications to the villages (Kara et.al., 2009). The project that aims to expand the use of new agricultural techniques and technologies, to ensure the correct use of agricultural inputs, to ensure that the producers receive on-site information, to increase the level of plant and animal production and to increase the income level of the people living rural area was implemented by Agriculture and Rural Affairs in 01.01.2004 (Ceylan, 2005). The distinctive feature of this project is creating opportunity for advisors and farmers to live together to adopt principle of locality and participation. It is planned that the farmer will receive service from the consultant according to his needs and pay the price of the service he receives (Özçatalbaş, 2009). The project constitutes an intermediate form for the privatization of agricultural extension services and the transition to the Free Agricultural Consultancy system[24]. In 2006, with the entry into force of "Regulation on the Regulation of Agricultural Extension and Consultancy Services" producer organizations, chambers of agriculture, agricultural consultancy associations/foundations, consultancy companies who employ agricultural advisors and individual advisors enabled to make paid extension (Aktaş, 2005). Özçatalbaş vd. (2010) mentions that Köy-Mer was provisioned the basis of privatization of extension from 2004 to 2006. Agricultural extension agents that were assigned to villages were taken out of villages and transferred as civil servants that works in district directorate of the Ministry. In 2006, another project called "Assessment of Improving Agricultural Extension Project-Tarımsal Yayımı Geliştirme Projesi (TARGEL)" that stepped on the ground of Köy-Mer attempt to be implemented. Demirbük and Kızılaslan (2017) claims that TARGEL was the last inclusive project implemented in terms of public extension.

The Agricultural Extension Development Project (TARGEL) was initiated in 18.04.2006 within the scope of "Agricultural Law" numbered 5488, which regulates the rural development (ibid:74). Its aims were ensuring rural development, reduce development differences between regions, increase the living standards of rural population and reach sustainable development through transferring scientific knowledge and technology (Aydın, 2009). The project aims to put the farmer at the center of information by making the agricultural extension services efficient. The project claims that the services provided to the villagers and farmers and the solutions

[24] While KÖY-MER project was conducting, the first legal regulation to liberalize agricultural consultancy entered into force called "Regulation on the Regulation of Agricultural Extension and Consultancy Services" in 08.09.2006. Individuals certified according to the provisions specified in the regulation are called "Agricultural Extensionist (Tarım Yayımcısı)".

developed from the center are not sufficient. The main motto of TARGEL is “services to the village and the peasants should be in the village.”[25] (Anonymous, 2007). Just like in the KÖY-MER project, agricultural engineers were appointed to the villages as extension agents to deliver on site information. The project was completed in 2016. Demirbük and Kızılaslan (2017) underline that the projects TARGEL did not achieve the targeted success due to following reasons:

> -Within the scope of the projects, 46.8% of the technical staff which is assigned as agricultural extension agents to the villages did not take Agricultural Extension course within the scope of their undergraduate education.
>
> -Agricultural engineers that were assigned to working as extension agents states extension staff assignments were not made in accordance with the product pattern of the region. It was emphasized that the faculty of agriculture has different branches of specialization and that the engineers who graduated from these departments should be appointed according to the relevant production pattern. For example, assigning an agricultural engineer who graduated from field crops department to an animal husbandry intense region.
>
> - The insufficient physical infrastructure was also an important factor. Many engineers did not have offices, and the vast majority of them did not have vehicles, phones, or internet.
>
> - The number of villages where the agricultural publication specialist is responsible is too much to visit properly and regularly
>
> -Both KÖY-MER and TARGEL projects were initiated to trigger demand driven approach in extension, where farmers demand and pay the price of information. Yet extension agents emphasized that farmers usually did not ask questions especially related with production. To some extent they asked questions about state aids and credits.
>
> -The number of women extension agents needs to be increased against the domination of men in the villages.

Another factor that was revealed not from literature but from my interviews is that most of engineers are graduated from university are accustomed to living in the city and could not adopt the rural life conditions. Engineers assigned to the villages hired apartment in the districts and distances between farmers and them is reproduced again. Assigning a city dweller engineer to the rural area and expecting rural development is a top-down approach as there is no organic relation between farmers and extension agent. Aktaş (2005) also claims that in both two projects farmers are seen as objects that needs to open itself for information transfer not as an autonom individual. Nusret (50, agricultural engineer, Edirne) mentioned that these two projects of the Ministry that was inspired by ÖÇP, resulted in a complete disappointment for him. He passes his remarks as:

> It is unrealistic to assign an agricultural engineer an outsider the village and expect him to serve without infrastructure work. Even in agriculture, cells must accept each other

[25] Köye ve köylüye hizmet köyde olmalıdır.

> when grafting trees. Otherwise, the fruit does not taste so good. In ÖÇP we are creating advice circles for farmers and within the farmers. Our relationship flows naturally. Besides we are trying to create awareness in farmers eye, expect them to first realize their own needs. It is a different paradigm.

Fatma Tangur (46) who was assigned to İmamoğlu village in the scope of TARGEL in 2010 expresses the working conditions as follows:

> I did not have a separate office. Peasants helped me to find a chair and a desk next to milk tank insidethe cooperative building. It was also hard to work as a single woman in rural area where men are dominant. While transferring information and technology I see the prejudice of their eyes saying that 'what would I possibly learn from a woman?' I felt like I have to constantly renew my confidence inside myself to survive. I did not have a vehicle also, transportation to the villages was also a big problem.

Photograph 5-16/5-17: The extension activities of Aysel in scope of TARGEL showing the male dominant working conditions

Furthermore, Orhan (60, farmer, Edirne) from ÖÇP also shares his opinions about TARGEL as follows:

> In 2010, a woman TARGEL employee came to our village The peasants opened their house to her for a few days. I also helped her to stay, we would like to take care of her but she found the conditions very difficult. She wrote a petition to be appointed to the district directorate than left. Both in KÖY-MER and TARGEL projects semiprivate advice circles were attempted to be generated by state's hand but the results were not satisfying. Circles could not be generated as advisors were unable to be adopted.

ÖÇP, KÖY-MER and TARGEL are projects prepared to improve agricultural production techniques with scientific methods. Experts of ÖÇP have duties such as constantly communicating with farmers, bringing them together with scientific knowledge, placing rational mind in their world by understanding the language of the farmer, and making them see agriculture as a profession. They do this with a participatory approach, through consulting circles in which the farmer is integrated. By paying the price of the service received, the farmer becomes a stakeholder of the system. In ÖÇP extension understanding, power/knowledge relation is exercised continuously in the interaction between farmers and experts. Farmers are active agents in creation of scientific knowledge by spearing sources for demonstrations and researches. Farmers also contributes to research projects by transferring experiences to extension experts of ÖÇP. The power of acting collectively of the association was key to transfer scientific knowledge and technology. Advice circles enable members and experts to practice round relations which prevents top-down approaches to be emerged. On the other hand, both KÖY-MER and TARGEL projects states power that attempt to determine the relation between experts and farmers is dissolved, in Raşit's saying grafting was not satisfying and the fruit does not taste so good. The experts stayed like outsiders and could not interact with farmers properly due to the discontinuity of communication and lack of infrastructure. As Aktaş (2005) criticizes although these projects aim to create demand driven extension ecosystem, farmers were still posited as objects that were waiting for asking questions to experts and receiving the information as it's supposed to be. In practice, it was emerged that most farmers did not ask any question or paid for it. The imagined interactive environment between extension agents and farmers was not able to constructed. The result that these projects performed poorly, were inadequately funded and lacked a coherent linkage with farmers and engineers.

ÖÇP has been continuing its activities since 1986. Despite the changing economic policies and cutting the aids, it survives due to the its constant interaction with the farmer. Raşit says ÖÇP survives because it is a project that with both feet on the soil.[26] Today, it attempts to deliver digital agriculture to their members in the most efficient way. Nusret (50, agricultural engineer, Edirne) that they began with drones and continue as follows:

> We made a deal with a drone company and gathered the members. First, we made a presentation and then we made demonstrations in the fields to show benefits of drones. We held these meetings several times. Farmers did not react. We thought there was a

[26] "Ayağı toprağa basan bir proje olduğumuz için hayatta kalabiliyoruz."

> problem. We asked ourselves why farmers didn't show any interest although it has many useful aspects. Due to the research, we made, it turned out that our members had difficulties even in using the application where the necessary drone images require be placed or even opening an e-mail address. We noticed that our average age is 59. Digital technologies are entering the market fast and we need to catch the train. Looking at the practices in the world, we realized that the most appropriate thing for our country is to move forward with the youth under the head a cooperative. When the farmers realized that their children will continue to produce, they started to invest in digital technologies. We opened agricultural production and sales cooperative and brought together the children of farmers. It does not matter they are doctors, engineers or managers. They may not know how to drive the tractor, but they do know how to use the technology. If we make the machines smarter, digital, the young people will show a great interest to continue agricultural production.

By opening agricultural production and sales cooperative in 2005, ÖÇP introduces digital agricultural technologies to young generations. The main aim of this cooperative to make digital technologies attainable. Salim mentions that ÖÇP sees adopting digital technologies as a precondition for sustainability as follows: "Agriculture is changing and sustainability is the driving force. Digital technologies will become must in near future we need young generations to lead this change. They have a high skill in using technology but they don't know agriculture. Our advisors will take place to fulfill this gap."

Likewise, Nusret expressed that as ÖÇP they are following meetings, summits, workshops about digital agriculture. He realized that there are only technology-oriented companies not the farmers with his statements as: "CEO's of the companies are telling magnificent stories, emphasizing the benefits of digital agriculture. But when I look the audiences most of them are companies again. Where are farmers? Every time I ask this question to myself." His words imply how digital technology is driven to become an essential input in farming.

Due to change in agriculture new linkages among private and non-public organizations are emerged. As an answer of the question of Nusret, agribusiness companies involve farmers and associations related with agricultural producers in terms of contract farming. By doing this, they lead producers to adopt and use certain inputs and technology as well. Contract farming, broadly defined as agricultural production and marketing carried out under a previous agreement between producers and their buyers that defines the rules of agricultural production especially determining the applications of seeds, pesticides and fertilizers (Gersch, 2018). In this case, firms supply technology package to farmers under a contract farming agreement implies the related farm output is sold to the related agribusiness firm (Eaton and Shepherd, 2001).

Extension service is provided as a part of this package to inform farmers how the appropriateness or range of uses of inputs. In other words, the contract generally includes delivering information on how the production should be carried out and how inputs need to be applied that are provided by agribusiness firm such as seeds, fertilizers and digital technology (FAO,2017). Glover (1984) expresses that firm provides credit, inputs, farm machinery rentals, digital agriculture technologies, technical advice and retains the right of rejecting if the product is not produced under the standards of the agreement. He asserts that due to imbalance of power and information between farmers and agribusiness firms, firms enabled to impose contract terms and organize it to reduce payments to farmers. On the other hand, Minot and Ronchi (2014) claims that although contract farming is open to be manipulated by firms retaining power, especially in developing countries, contract farming contributes to improve more agents in agricultural production.

When analyzed structurally, it is revealed that contract farming is based on favors of agribusiness firms and company-driven contracts. On the other hand, in Foucauldian terms, it results in different power/knowledge relations. To illustrate, Meliha (37, farmer, Çanakkale) is a university graduate, city dweller and had no knowledge related with agricultural production but always had a big enthusiasm about production. Following words of her illustrates how power/knowledge can be possessed by different agents.

> I worked as a white collar for many years. Then one day I just would like to quit everything and startfarming. I start contract farming by making agreement with the company. All the knowledge and techniques I require was supported by them. They lead me how to sow, cultivate and harvest. I was introduced with climate stations and NDVI technology with also support of Antalya's Chamber of Commerce and Industry. I easily learned how to use them and took the advantages. Indeed, I am very keen on using new technology in agriculture. It enables us to produce low carbon footprint and make sustainable farming with low cost, high yield and quality. It is a golden opportunity for producers who enter agricultural market later, like me. Soon after I gain power, I have chance to create employment for women in the agricultural production. They are keeper of our agriculture. I have been learning the traditional knowledge from them. The size of my arable land increased now. While I continue contract farming by empowering women and transferring knowledge and new techniques to them, I also learned a lot from their experiences.

As revealed in the interviews, digital agriculture might be acknowledged as a precondition for sustainable farming. Farmers, engineers who use on-farm data directly or indirectly emphasizes the benefits of it. The institutions or companies that attempt to conduct extension projects to deliver techniques and knowledge of digital agriculture advocate how it alleviates the environmental concerts and thread of food insecurity. On the other hand, whether it is public or non-public, extension of digital agriculture promotes the utilizing of on-farm data in managing use of agrochemicals and hybrids. Indeed, the term agricultural extension itself ensures promoting rationality of industrial agriculture. The rationality of development projects which is the driving force of determining the delivery methods of extension was based increasing productivity and economic growth (Glessman, 2022). In the framework of Green Revolution, the dominant paradigm in agriculture, the regime of truth in Foucauldian sense, was input -intensive farming. Information related with using agrochemicals was delivered by extension experts. Today there is a paradigm shift towards sustainability rather than intensive agriculture due to its heavy costs to the environment and threatening the food security. Promoting sustainable agriculture is regarded as a new sustainable development pathway as a part of 2030 Agenda for Sustainable Development adopted by the international community in September 2015 (Ahmad and Nabi, 2021). The 2030 Agenda for Sustainable Development aims to establish enabling environments for sustainable development by accepting European Green Deal.

Sustainability becomes the new regime of truth in agriculture and extension services either in a range of governments, non-profit organizations, and private enterprises undertake actions to deliver information and technology that ensures sustainability. In this regard, the backbone of the regime of truth become the extension of digital agriculture. It enabled farmers to operate their actions based on real time data, managing their actions with predictability and reducing the number of agrochemicals used in production. In accordance with sustainability, the regime of truth in agricultural production, projects such as smart villages were attempted to be implemented to disseminate big data use in agriculture. On the other hand, implementing technology stations next to the village does not instantly impose *smarter* operations. Indeed, this reasoning is criticized as offering "technological fix" (Goodman and Redclift, 1991: 142).

This criticism presents the same perspectives with the term "rendering technical" that is coined by Cook et al. (2021) expressing reducing social and historical phenomenon into technical prescriptive. As discussed above in all types of extension, certain strategies of resistance, particular tactics in Foucauldian sense have been developed in power/knowledge relations between extension agents and farmers.

Although since 1980s the participatory approaches were tired to be initiated rather than top-down approach of extension, within the neoliberal agenda participation is remained to be defined by becoming cost-sharing agent.

5.3. Assessment of epistemic injustice in both public and non-public extension

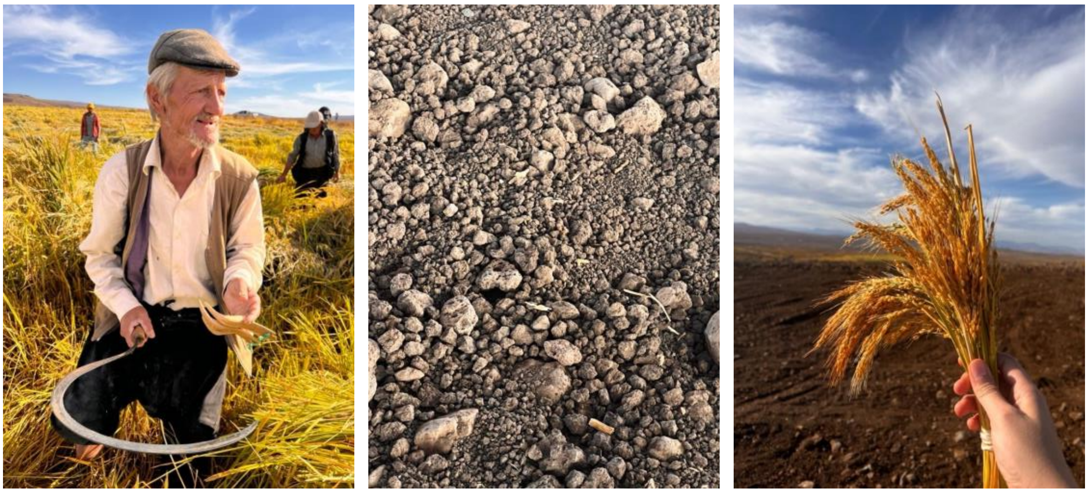
Foucault indicates that the regime of truth is consisted of power/knowledge relations that decide what is includable and excludable (Taylor and Vintges, 2004). In general, agricultural extension excludes farmers local knowledge and today in the framework of sustainability, extension of utilizing on-farm data approach excludes the experience and memory of farmers. In other words, data bows experience. Boogard (2021) indicates that development projects that are transferred from Europe to developing countries might create *epistemic injustices* by exclusion of local knowledge and memories of the communities. Dotson (2014) uses the term *epistemic injustice* to refer to such "persistent epistemic exclusion that hinders one's contribution to knowledge production" (Dotson, 2014: 115). Santos (2014) conceptualizes a loss of knowledge that is the result of longstanding structural oppression by historical, social and political forms of domination as *epistemicide* – the death of the knowledge. Boogard (2021:29-31) claims that in agricultural development projects West was considered superior. The assumed superiority of West caused the loss of indigenous epistemologies local knowledge of farmers in Africa. Boogard claims that boosting digital technologies and use of big data might cross the line creating epistemic injustice and totally epistemicide local knowledge. Martinson and Campbell (1980) claim that digital agriculture is based on commodification of agricultural information. They claim that it includes appropriation of farm-level decision processes through substitution of local knowledge (ibid:529). Thus, advancements of digital agriculture with the superiority of on-farm data might epistemicide other agricultural actions based on local knowledge that can be count as also sustainable.

Local knowledge is produced from practices that are honed over generations of observations and experiences (Briggs, 2005). Farmers have been developing ways to interfere with nature to satisfy the immediate food by trying different ways cultivating. Scholars (Anaeto et al., 2013; Kolawole, 2013) list what constitutes local knowledge as being rooted in place, being connected to people and being shaped by collectively. It is embedded within cultures and provides records of what has worked in the past in terms of experiences that local people draw upon (Wang, 2015). Anaeto et. al (2013) asserts that it is dynamic as its constantly adapting and find way to cope with change in nature in terms of the body of cumulative experience. It is largely based on collective observation and orally diffused via rituals, stories and fables from generation to generation, farmer to farmer. (Radcliffe et al., 2021). On the other hand, Chambers (1983) and Razeghi et al. (2011) criticize the term of “local knowledge” and offers the term “rural people’s knowledge”. They reject oversimplifying the knowledge embedded within the region by saying “local”. On the other hand, they claim the name needs to express rural knowledge includes people existing as a system of concepts, beliefs and ways of learning. They claim transition towards more sustainable agriculture and strengthening agricultural resilience requires integrating local knowledge, learning from rural people’s knowledge.

Today, several studies have been conducting to design integrative knowledge management systems for sustainable agriculture by considering information sources as both on-farm data and farmer’s indigenous knowledge (Moschitz et al., 2015; Tisenkopfs et al., 2015a; Wood et al., 2014). Extension systems are redesigning by focusing on participatory approach not integrating farmers as cost-sharing agents but also integrating their ways of doing, local knowledge (De los Ríos et al., 2011). Rather than top-down technology transfer model in other words rather than reinforcing rendering technical and offering technological fixes, co-creation of knowledge has been promoted by integrating local knowledge into institutionalized scientific knowledge (Wood et al., 2014). The study of Sumane et. al. (2017) indicates sustainable agriculture is ensured by multi-actor knowledge networks where different types of knowledge negotiate. They claim that farmers being active partners of generating knowledge and co-producers rather than passive receivers. Curry and Kirwan (2014) state that local knowledge is embedded in farmers daily life and self-organized. Tisenkops et. al. (2015a) claims that integrating local knowledge into institutional knowledge requires *knowledge mediators* that both understand the farmers language, record local knowledge and able to support farmers to become active agents in knowledge generation. Sustainable agriculture is advanced by co-learning and mutual support (Wood et.al.2014). This discussion led me to conclude a farmer driven knowledge management for sustainable agriculture requires integrating local knowledge, recording memory and prevent epistemicide by on-farm data use. Buckley and Shortle (2015) claim that is also advocating that farmers have developed their own approaches for centuries since the first intervention to the nature. They indicate this cumulative experience is an essential knowledge source for sustainability.

For example, Karacadağ rice is one of the most special agricultural products of Turkey due to its nutritional value and geographical characteristics (Köten et.al.2020). It is grown in volcanic mountain called Karacadağ located on the provincial border of Urfa and Diyarbakır. It is grown by natural spring waters on basalt stone lands on the foothills of Diyarbakır Karacadağ and is harvested by hand. Karacadağ rice is irrigated naturally only with underground spring waters and melted snow waters. The hand-harvesting period of Karacadağ rice on basalt stony lands is hard. During the difficult harvest period in the stony land, men mow the ears of rice with sickles. The paddy Karacadağ rice collected by the workers is laid out on empty fields and left to dry under the sun. Mahsun (52, farmer, Diyarbakır) who is the producer of Karacadağ rice indicates the importance of local knowledge in agricultural production as follows:

> Right now we are on basalt stony. We are producing our foods from stones, it is a hard work. Especially the paddy requires water. Rice resembles like a fish. When water is cut, fish dies so does rice. Imagine Diyarbakır, a place where thermometers show 50 degrees in summer and we are trying to cultivate paddy on basalt stones. We are making a smart farming here without using technology but the wisdom of local people. There is a village called "Çermik". The rural people of Çermik specialize in seeing which direction the water flows under the basalt stones. They make some measurements with the help of rulers and pipes and guide us before sowing. Without their orientation it would be impossible to irrigate the paddy. Çermik people guide us in which direction to cultivate paddy. Furthermore, the skills of rural people mowing the ears of rice with sickles is essential for harvesting. Remember our field is consisted of basalt stones not soil. Without skilled manpower, it is impossible to harvest the paddy.



Photograph 5-18/5-19/5-20: Field with basalt stones, harvested Karacadağ rice

Moreover, Mehmet (58, farmer, Mersin) from Tarsus expresses the utilization of local knowledge in agricultural production in following words:

> I am inclined to use digital technologies in agriculture. For example, I use the early warning system very effectively. I plan my agricultural tasks according to the weather forecast and disease modelling. I When the villagers ask, I tell them too. In the past, we were asking nomads that visited our village. We asked them how this winter will be. They knew. They would smell the air at the top of the mountain, rub salt on their goat's back, observe the amount of time that goat licks the salt, somehow, they would understand how the weather will be. Sometimes they say 'it will be cold this winter, sow the wheat a little later, or this is the time to sow your seeds before the winter rains.' They were the first early warning systems I have met. Sometimes we get wrong data when we don't take care of our equipment, but the nomads were always right."

On the other hand, when conducting fieldwork, I realized that the approach of integrating local knowledge to institutional knowledge, creating learning bridges between farmers and technology-oriented extension agents ask the question in one way. Nobody asks if farmers need to encounter with knowledge mediators to use digital technologies. Involving the farmer in co-production of knowledge seems to be a one-way approach developed by knowledge producing institutions. Hence, I also asked the question in reverse. How does the farmer, who has local knowledge, manages agro-ecological relations and produces agricultural products approach scientific knowledge and digital technologies in terms of sustainability? I claim that to design a farmer driven knowledge management, opinions of farmers towards integrating technology with local knowledge need to be revealed.

Farmers opinions towards integrating technology with local knowledge: Being a child of time

My aim by asking the question backwards is giving voices of farmers who manage farming activities with agro-ecological local knowledge about integration of scientific knowledge and digital technology. All of my interviews stated that technology and scientific knowledge must be followed in agricultural production in today's extreme weather conditions. They express that they amalgamate different sources of knowledge as such mixing scientific knowledge they have obtained from universities with their own experiences. Also, they underline that agricultural production could not be continued by ignoring the knowledge of the time, but that local knowledge should be preserved and reinterpreted according to the needs of the age. In case of using digital technology, they partly data skeptic to some extent. They claim that farmers might take the advantage of data but wouldn't allow it to substitute local knowledge and the culture around it. For example, İkbal (66 farmer, Kastamonu) asserts the importance of balance between scientific knowledge, technology and local knowledge in following words:

> My farm is in Kastamonu. Using the ancient knowledge of this region, we produce foods without using drugs. For example, I apply techniques that I learned from my grandfathers such as rain harvesting, compost wells. Instead of using pesticides, we develop alternative methods acting together with agricultural engineers and professors at the university, for example, we are currently applying the drug free hanger system. I adopt the developing technology as long as it benefits the health of humanity and the environment. For example, I wanted to buy a digital early warning system for my farm. We can roughly predict when frost will occur, but due to climate change, calendar of nature has also changed. Deviations are emerged in the plans. Since we could not predict how the weather would go anymore, our einkorn wheat flattened last year, this year the chickpeas got damaged, the beans were burned as a result of unexpected weather conditions. We have to use new tools to cope with extreme natural events. I could not afford to buy the system but hopefully I will someday.

Likewise, Nuriye's (62, farmer, Mersin) words from Mezitli also indicates how technology and local knowledge need to be in reciprocity:

> Today we are drowning in cities. Why? Whose fault, is it? It's the crime of humanity who thinks that they can beat everything with their mind that ignores the language of nature. I have been observing the bird, the soil, the water for years. I grew up with my grandparents on this farm, I learned a lot from them. But I can't continue solely with my grandfather's way of doing. Knowledge should be updated constantly; engineering and scientific knowledge should be involved. My grandparents were also making their own science. It matters how farmer blend local knowledge and technology. While making this blend, it is necessary to take care of both people and nature's health. Can we expect people who are alienated from their own nature to practice natural farming? The soil is next to me, the water - next to me. I learn fromit, from books and from technology than I make decision on cultivating. Right now, I am growing avocado trees in the principle of agroecology. Nature has change even since we start talking. It has an endless change.

> They ask me if I'm afraid of the climate crisis. I'm not afraid at all. People marginalize what and whom they don't know and afraid of them. I know the climate, the soil and the seed. I have no difficulties adapting to their change. I am also a part of it and able to survive in the change. I am the child of time.”

Statements of Betül (70, farmer, Sakarya) also assert how she develop data skepticism:

> A farmer who does not follow technology and scientific knowledge lose his/her sight. Proceeding by relying only on his/her own experience turns the farmer into a closed box. A farmer must have one footin the soil and one foot in research institutes. S/he should blend local knowledge with scientific knowledge and continue its environmentally friendly production by adapting to the changing age. Let me tell you a story. One day a man cut off a caterpillar's leg and told him to “jump”. The caterpillar jumped. Then he cut off another leg and said “jump”. This time the caterpillar could not jump. The man concludes that when he cut off both legs of the caterpillar, it became deaf! How you access and utilize information is very important. We should not allow technology to appropriate your local knowledge and experience. Technology companies would like to sell data by substituting local knowledge. I am skeptic towards use of digital agriculture by also accepting the benefits of it. Unions of producer cooperatives should be able to develop technology, not companies.

Vahide (64, farmer, Yalova) on the other hand mentions the importance of integrating technology by emphazising embeddedness local knowledge as:

> I grew up in the field and learned agricultural production by following the techniques of my grandfathers. At that time, agriculture was part of daily life. It is for me now. But it was different back then, people's life was consisted of agricultural practices, the soil was right next to us. I remember the riddles my grandfather asked me in the evenings when I was a kid. They were even about agriculture. For example, let me ask you one of them, "black chicken stands on the branch” that’s my favorite. It is not hard to estimate when if it’s Yalova but let me tell you. It is olive. See, it is creative! Nowadays, the biggest issue is to carry out agricultural production efficiently, life in all aspects is not consisted of agricultural production, as it used to be. Nature is changing also. Hence, we need to use technology. I sometimes share a post on Facebook about preparing compost, in case people apply it. This is also using technology, flying the drone in the field is also using technology. I think the issue about technology is accessibility and to use it for the benefit of humanity. The techniques of my grandfather’s contain ancient knowledge, technology includes scientific findings. Both are very important, but my grandfathers are disappearing. If it is not transferred on to the next generation, it will completely loss. What a pity to know that so much cumulative experience, memory, local knowledge embedded in culture is at stake to be lost. Maybe digitaltechnologies save them from losing and transfer it to next generations.

With the question I asked the other way, I realized that the farmer who produces by utilizing local knowledge is open to utilize technology to the extent it supports benefits to environment and humanity. They also emphasize that two different modes of knowledge need to be amalgamated to cope with today’s challenges in agriculture. They mention that local knowledge should be preserved and transfer to next generation since it is the result of cumulative experience. On the other hand, they say, to be the child of time, farmers need to follow technological advancements. They assert that they are open to use on-farm data but not giving superiority to it. Emphasizing that the soil is right next to them and local knowledge is produced from it, reinforces the statement of Raşit from ÖÇP that "we must create projects that put their feet on the soil."

Moreover, there was a significant difference between the course of my interviews with agroecological farmers in the field and agricultural engineers at companies or institutions I find this autoethnographic note important to reveal how I have experienced different modes of knowledge as a researcher. My conversations with the farmers who manage their farms with local knowledge were often interrupted or delayed for the wood to be thrown in the molasses cauldron or for the eggs to be taken from under the chickens. Therefore, the interview continued in circles with an uncertain beginning and end. I experienced the statement that local knowledge is embedded in daily life of farmers. On the other hand, my interview with the engineers were progressed linearly, the beginning and the end were clear, and it was completed without interruption. I have experienced the instrumental rationality of scientific knowledge. For me, this autoethnographic experience, the circles reproduced by farmers utilizing local knowledge, the straight line produced by agricultural engineers equals Gertrude Stein’s poem “Rose is a rose is a rose is a rose” that implies things are what they are.

As discussed above, understanding agricultural technological developments with instrumental rationality reduces sustainability is a matter of technological fix. On the other hand, such a reductionist approach seems to dominate the current sustainability discussions. Today international negotiations have been held, commitments have been organized as such Kyoto Protocol, Paris Agreement and European Green Deal transform economies towards limiting and reducing greenhouse gases. Governments those who are the part of such agreements and those on the way have also developed their own action plans towards sustainability. In line with European Green Deal, The Republic of Turkey has also developed Green Reconciliation Action Plan to cope with climate change and environmental degradation. It is important to note that agriculture accounted for 73 Mt of Turkey's total 2020 GHG, including 61% of its methane emissions and 80% of its nitrous oxide emissions (TUIK, 2020). In the action plan released by Trade Ministry in 2021, a strong emphasis was made in maintaining sustainable agriculture by strengthening necessary technological infrastructure for green transformation (Bir, 2021). The Deal introduces sustainability as a concept that be achieved through a technological fix by putting forward the benefits of using on-farm data on the management of agricultural decisions with remote sensing and informatics applications. I argue that this approach is at stake to be *rendering technical* and create epistemic injustices by giving superiority to technology over local knowledge.

The dissemination of technology and scientific knowledge has changed since the 1950s, the public service nature of extension has weakened, and access to agricultural scientific knowledge has become commercialized. This change has affected the encounter between expert knowledge and farmer knowledge. Farmers have developed different strategies in different periods in the face of the authority of scientific knowledge. Today, the dominant regime of truth in agricultural production is sustainability. In the agreements that were made between sovereign powers it is emphasised that sustainability is ensured with utilizing digital agriculture technology and data driven agricultural practices. On the other hand, the concept of sustainability should not be reduced a technological fix, it should be treated in historical, social phenomenon. The departure point should be how farmer reach and utilize necessary information for ensuring sustainability in agricultural production (Rivera et al. 2005). Deployment of digital agriculture is expected to affect governance of agricultural knowledge and advice networks (Fielke et al.2020; Geerling and Eiff; 2019). Hence, the implications of digitalization need to be examined to what extend it transforms and reshape socialization of agricultural knowledge. As stated above, In Turkey, the most widely used technology as digital agriculture is digital climate stations. They are designed to combat the unpredictability of climate change, which is becoming a major problem in agriculture. It aims to reduce the losses and damages in agriculture caused by climate-related factors such as sudden weather changes and changes in pest emergence times. In this sense, it provides farmers with onfarm-data-driven information such as weather forecasts, soil temperature, leaf moisture, infection risks for crop protection and nutrition schedules. In other words, Fieldclimate aims to provide farmers pesticide spraying and fertilization periods at the right time by processing the climate data obtained by processing digital sensors within the framework of certain algorithms. By doing so, it is intended to direct reduce the use of pesticides and fertilizers and so the ecological damages of input-intensive agriculture. There are different ways of installation and utilization of climate stations in Turkey. In terms of public extension, The Ministry of Agriculture and Forestry has installed the stations in certain cities through Provincial Directorates of Agriculture. Agricultural engineers working at the Provincial Directorates of Agriculture interpret the data provided by the digital stations and inform farmers about crop nutrition and protection programs. Farmers who register in the system of the Provincial Directorate of Agriculture receive early warning notifications via SMS regarding the fight against diseases and pests. In addition, banks investing in digital agriculture solutions have donated these stations to various agricultural NGOs, aiming to reduce the amount of pesticides and fertilizers used by farmers. In addition, particular telecom companies have collaborated with the station company facilitate farmers' purchase of early warning systems (installments, deferred payments). Private agribusinesses, especially with certification of Good Agricultural Practices (GAP), use the station extensively to reduce the amount of agricultural inputs by applying them at the right time. Agricultural engineers working in agricultural businesses comply with the principle of eliminating the factors that harm ecology and human welfare due to unconscious use of pesticides and fertilizers, which is included in the GAP certificate, with the agricultural production decision they make using early warning systems.

In Turkey, a study measuring the impact of early warning messages that are included in public extension services has not been conducted yet. It is stated that with public support, big data-driven information is delivered to farmers and they are tried to direct them to the right practices at the right time, thus increasing the sustainability of agricultural production. Issues such as what farmers do with big data-driven information, how they make sense of these stations, how this information interacts with existing information sources and how it affects decision-making processes have not been discussed. To do this, this study is based on the quadrilateral of the comprehensive model of AKIS consisting of knowledge farmer, education, research, decision support systems. Firstly, it reveals how agricultural scientific knowledge is generated, how it is transferred to farmers and how farmers utilize this knowledge. It utilizes the Foucauldian framework of power/knowledge to examine the process of socializing agricultural knowledge. Then, the other part of the quadrilateral, digital agriculture, which is considered as a decision support system, is taken and its effect on the socialization processes of agricultural knowledge is examined. To understand the socialization of agricultural knowledge which interacts with surrounding economic and political structures and evaluate the implications of digitalization, I conduct a field study in Geyve. With the field study, I aim to explore how agricultural knowledge is socialized in Geyve and how digitalization is integrated into it. I aim to explore existing information networks and the implications of digitalization by employing ethnographic research methods. I aim to evaluate my findings within the framework of critical historical analysis which I conduct with a Foucauldian approach in the previous parts of the thesis.

6. RESEARCH DESIGN AND METHODOLOGY

This study seeks to evaluate this study tries to understand how agricultural knowledge is socialized by analyzing power/knowledge struggles that are emerged by complex process of negotiation in which a variety of social actors and institutions are involved. With the rise of sustainability discourses, digitalization and the use of big-data permeate information flows (Fielke et al., 2020). Real-time data-based information provided by digital tools expected to empower farmers in the combating climate change (Pant and Odame, 2017). This dissertation approaches the integration of digitalization and data-driven information into socialization of agricultural knowledge as a historically specific instance resulting from a wide range of political, economic and social circumstances. This approach allows to explore how technoscientific developments contextually mediated by both embeds and embedded in the societal. The integration of digitalization both shapes and is shaped by the relationships between various actors, information networks, linkages and discourses. The theoretical framework of this thesis is based on Science, Technology and Society (STS) studies especially on co-productionist account which enables to conceive that science, technology and society evolve together. Attempting to avoid the charges of both natural and social determinism, co-productionist framework of STS create rooms to explore the social dimensions of science and technology and material dimensions of social formations (Jasanoff, 2004). Thereby,

I develop my research questions as follows:

- In which ways agricultural knowledge is socialized through what kind of power/knowledge struggles in Geyve?
    - In which ways power relations are maintained, through which mechanisms they are reinforced?
    - In which ways resistances are emerged, through which mechanisms they are reinforced?

- What are the implications of digital climate stations on socialization of agricultural knowledge in Geyve?
    - In which ways it is involved into power/knowledge struggles?
    - To what extend it underpins sustainability in agricultural production?

In order to respond to these queries, I aim to design a micro-level fieldwork to collect empirical data and interpret collected data with respect to theoretical framework. Theoretical foundations of co-production enable to situate agricultural knowledge and information system in its historical and social context. To properly respond this background, I choose Geyve district of Sakarya province as my field for following reasons explained in the next section. I firstly identify relevant actors in the socialization of agricultural knowledge and reveal how they interact with each other. I attempt to situate such actors within the historical and social context in terms of their relevance with generation, extension and utilization of agricultural knowledge. In my fieldwork, I explore how agricultural information and knowledge is socialized through the emergence of linkages and information networks. I conducted a qualitative research method and conduct ethnographic field research in Geyve. In this context, I conducted in-depth interviews with the identified actors and also applied the participant observation technique. I sought to collect data by participating in the daily lives of farmers I interviewed, spending time with them in the ordinary course of their lives.

Vannini (2009) states qualitative research allow a reflexive, interpretive analysis that reveal highly contextual findings. Ethnography in this context, is described as an in-depth study to understand people's ways of life from the perspective of the people who take part in. The fact that etnography entails researchers' immediate involvement, participation and experience the lifeworld under study, it leads them to powerfully captivate the meaningful patterns and broadly understand the societal (Herbert, 2000). In the ethnographic field research, I used in-depth in-depth interviews and participant observation techniques. I developed my interview questions based on the literature and my previous analyses and reorganized them after the pilot field study. I received the opinion of experts in order to ensure the questions being local responsive and not "city-dweller question". After discussing my questions with academics from Agricultural Engineering Departments and taking their opinion, I finalized my interview questions. I start to field work on conduct it between 13.04.2023-20.05.2023. In-depth interviews create the opportunity to look deeper into the participant's life than the limited framework of a structured interview (Charmaz, 2004). I recorded the interviews, which lasted 90-150 minutes, with the permission of the interviewees, and then transcribed these audio recordings, shared them with those who requested. I stated that they could stop the recording whenever they wanted, and that they could request the removal of the parts they had discomfort during or after the conversation.

While my research universe is Geyve, my sampling is consisted of participants representing the processes of generation, extension and utilization of agricultural information and knowledge which are regarded as knowledge triangle. I went to institutions, organizations and companies that are responsible for the generation of scientific, expert knowledge. I conducted in-depth interviews with agricultural engineers working there. In Geyve, I noticed that the district agriculture as a public institution, the Chamber of Agriculture, Agricultural Credit Cooperative and Beet Grower's Cooperative as non-governmental organizations and various input companies and plant protection dealers as private companies were in contact with farmers. I conducted interviews with these experts, which shape the decision-making processes of farmers to a certain extent with the information they provide. I asked them how they obtain expert knowledge on agricultural production, the sources of information they use, and the methods they use to update their knowledge. In this context, I also questioned the role of digital tools and the use of big data in conducting research and producing knowledge. In addition, I also investigated the methods by which they transfer this knowledge to farmers and the extension tactics they have developed. For this purpose, I conducted in-depth interviews representing the public, self-governing organizations and private companies. I selected my interviewees with snowball sampling. I also spent time in these places to make participant observations. I had the opportunity to observe the farmer-expert dialogues that occur in the ordinary flow of life, the emerging needs of the farmer, the questions, the approach of the experts, and the information transfer processes. Sometimes I made observations only by shadowing and sometimes by participating to a limited extent (Holloway, et.al. 2017).

Photograph 6-1: The moment a farmer brings the leaf to the pesticide dealer to ask about the disease in his vineyard (voluntary consent of the individuals was obtained.

I started to conduct interviews with farmers and investigated the factors affecting their agricultural production decisions, which information sources they refer most when making decisions about production, which information sources they trust, how they relate to expert knowledge, in which ways they utilize or do not utilize expert knowledge, and the impact of digitalization and the use of big data on their decisions. In the first days of the fieldwork, I realized that the patterns and quantities of agricultural production in the lowland and in the mountains in Geyve are different from each other. While it is possible to use water in agricultural production in the lowland, irrigation farming is either not possible at all or is limited in mountain. I realized that the intensification of capitalist relations in production has a direct impact on the agricultural information and knowledge system.

The information needs of farmers, the way they meet these needs, and the way they apply this information are sharply determined by geography. For this reason, I divided Geyve into lowland and mountain regions. I also observed that the gender of the actor who decides on agricultural production has changed sharply as a result of the expansion of capitalist relations in production. I realized that gender is as important a determinant as geography in accessing, extending and utilizing knowledge. Therefore, while designing the ethnographic fieldwork I conducted in Geyve, I took into account the lowland-mountain distinction and added another layer to this distinction, namely the gender factor. Considering the distinction between men and women together with the issue of the dissolution of the family farming structure, my basic dichotomies are revealed respectively as lowland-mountain, women-men. I occasionally found the farmers in places I observed in the usual flow of farmer-expert dialogues. In other cases, I requested support from the district agriculture due to the farmer registration system database and in some cases I enlarged my interviewees with snowball sampling. As Low (2017) states, I witnessed that through participation, the researcher engages in an intensive learning process about the topic being researched. Participant observation enabled me to deeply understand and analyze farmers' information needs and the motives behind their information seeking. It made me realize the "implicit and explicit" aspects (Dewalt and Dewalt, 2011) in the socialization of agricultural information and knowledge. In particular, it allowed me to uncover dynamics that were not voiced, ignored or taken for granted during the interviews. I employing data visualization tool *lucidchart* to generate mind maps respectively as research, extension and utilization of knowledge and information.

6.1. Research universe of fieldwork Geyve: Fertile lands where all kinds of crops can be grown except tea and citrus

Regarding agricultural production in Turkey, Sakarya province has a long history of production with its rich natural resources, climate that allows the cultivation of many crops, and product diversity. The high natural fertility of the agricultural soils of the province, its rich ecology, the suitability of annual precipitation and its distribution over the seasons, the richness of water resources, its proximity to major consumption centers in terms of marketing and ease of transportation are important advantages for the agricultural sector. Agricultural areas constitute 42.37% of the surface area of Sakarya Province. Hazelnut in the north of the province, field crops in the middle belt and horticulture in the south are dominant. On the other hand, with a closer look, we see that vegetable gardening and field crops continue along with horticulture in the south of the province and especially Geyve district stands out with the amount and diversity in agricultural production.

Geyve has been a source of inspiration for many different authors with its fertile soils and rich ecology. For example, Evliya Çelebi referred to the Geyve Strait as the "Sea of Trees" in Seyahatnâme (Dağlı, 2005). Referring Geyve as a dense wooded and forested area, Çelebi describes this sea of trees as follows. "In this sea of trees, there are so many kinds of big trees that their height reaches up to the sky, so that the fiery sun has no effect. They are such shady mountains. The scent of the flowers of laurel, juniper, pine and linden trees perfumes one's mind." In the local magazine entitled

Geyve that is prepared by Geyve District Governorship in 2006, which I came across during my work in the archives of Geyve Municipality, İbrahim Açılan, a teacher from Geyve, writes as follows: “Your vineyards smell of thyme / Your mountains covered with juniper and fir...I tasted the grapes in Umurbey and couldn't get enough / I was so mesmerized that I couldn't wake up.” The Umurbey grapes mentioned in Açılan’s poem and the microclimatic features that allow the mountains to be covered with different trees can give clues about Geyve’s agricultural potential.

Photograph 6-2/6-3: Umurbey’s vineyards that are mentioned in the Açılan’s poem

Photograph 6-4/6-5: Views from the Geyve Strait

Geyve is a district of Sakarya that has a critical importance in terms of agricultural production with its rich nature, microclimate and soils irrigated by the Sakarya River. Fruit and vegetable production is prominent in the district where all kinds of crops other than tea and citrus fruits can be grown. 24.52% of Geyve's land is agricultural land, 30% of which is irrigable and 70% of which is non-irrigable. Geyve's production pattern consists of 53.59% fruit, 36.44% field crops, 7.94% vegetables and 2.14% other activities.

Table 6-1: Retrieved from Sakarya Provincial Directorate on 12.05.2023

GEYVE District Agricultural Distribution in 2022		
Type of Agricultural Production	**Area (decar)**	**Rate (%)**
Field Crops	57.090,00	36,44
Fruit	83.800,00	53,49
Vegetable	12.433,00	7,94
Other uses	3.350,00	2,14
Total	156.673,00	100

First reason for choosing Sakarya and Geyve as a field for the thesis is the intensity and diversity of agricultural production patterns in the region. Due to the fact that as the production pattern diversifies, different sources of information and relationships are required, I consider to be allowed to observe different forms of information needs, flows and linkages. In addition, in the report of Sakarya Provincial Directorate of Agriculture, it is stated that sustainable agricultural practices are prioritized in the city in line with the vision of the Ministry of Agriculture and Forestry. Especially with the early warning devices known as digital climate stations placed in different areas of the city, it is aimed to reduce the amount of inputs used in agricultural production and to make a more environmentally friendly production. The Ministry established three digital climate stations through the Provincial Directorate of Agriculture in Geyve. With the data provided by digital sensors, it is aimed to enable producers to benefit from the opportunities of digital agriculture. The biggest advantage of digitalization for farmers is that it provides them with data-driven information to make the right decision at the right time. In Geyve, by utilization of such stations, it is aimed to regulate the right spraying programs of producers at the right time by providing predictability with early warning systems and empower them to cope with unpredictable natural events caused by climate change. Moreover, by the partnership of a bank and a telecom brand, a digital climate station is donated to Beet Growers Cooperative in 2020. Hence there are four different digital climate stations in Geyve. In addition, Geyve District Municipality states that an Innovation Center is planned to be established to make agricultural production in Geyve more sustainable and innovative (Aydınlık, 2021). This center is expected to bring together young farmers with innovative techniques and expand related information in the region. In these respects, Geyve is a promising field for a doctoral thesis that examines the implications of digitalization on agricultural knowledge and information systems in terms of empowering sustainable production.

Observing the actors in the ordinary course of events, keeping field notes and relating these notes to the main objectives of the research, utilizing participant observation as a technique to reveal the perspective of the local, enabled me to address socialization of agricultural knowledge in Geyve within the social conditions, in the flow of daily life. The interviews I conducted with male farmers in the lowland generally took place in village cafes and tea houses near pesticide dealers. The interviews were regular though other male farmers occasionally participated in the interviews. Due to the gender-based division of labour, men are responsible for activities such as soil preparation, spraying and fertilization, while women are responsible for continuous activities such as digging the ground, planting seedlings, hoeing and picking. Therefore, it was easier to interview male farmers than females.

It was quite difficult to reach the female farmers in the lowlands. Firstly, I requested the contact information of women farmers from the district agriculture directorate, stating that it would be used in scientific research. When I called the phone numbers they provided, I noticed that these phone numbers belonged to their husbands. The men who answered the phone implied that women were in the fields and that it would be difficult to meet with them during the production season. It was not possible to reach the women by mediating the men before meeting them face to face. For this reason, I expressed to the men I interviewed that I would like to meet their wives as well. Through them, I reached the women by heading to the fields. It was only once possible to have uninterrupted, regular conversations with the women. On a day when it was raining, they stated that they would do their house cleaning in the morning because they could not do hoeing, and that they could meet with me in the afternoon. In order to spend more time with them, I stated that they could engage me as a labour force in their production. I employed the 'Work and Talk' method (Halloway et.al.2021), whereby interviews were conducted in terms of co-working with farmers on their land.

Photograph 6-6/6-7: Examples from the field

Although convergence did not happen immediately -because I did not know and not able to easily comprehend how to hoe (as can be seen from my sunglasses)- I participated in tasks such as washing celery, fetching and transporting workers, picking up children from school, and washing dishes at home. Conducting interviews by working sometimes made it impossible for me to take notes. In this case, I used the senses to recall particular information in my mind. For example, after washing celery with Sevim, I encoded the sharp smell of celery that permeates the car into my memory in order to remember the sentence "women do all the work, men do the other work" that she had said in the car on the way to pick her child up. On the way back, I sent myself voice notes and recorded the sentences, behaviours and gestures that I should not forget. As Katz (2010) states, I used field notes to remind myself of the backgrounds that I would use to explain everyday events.

Furthermore, conducting interviews on the mountain had its own challenges. Since agricultural production in the mountains is less capitalized than in the lowlands, I realized that decision-making processes were collective. Women and men acted collectively in many areas. This enabled me to conduct focus group discussions. On the other hand, I waited for rainy weather again for these interviews. Since they did not employ workers in agricultural production, family farmers struggled to undertake all kinds of different agricultural activities such as animal care, pruning. Heading up to the mountains on these rainy days made transportation challenging. When the interviews were completed, I could not come down from the mountain until the heavy rain and fog had disappeared. During this time of waiting, I spent time with the women on activities such as brewing tea and collecting fertilizer in the barns.

In this study, instead of the claims of objectivity, impartiality and representativeness prioritized by the positivist approach, I chose the interpretivism of the ethnographic approach and the multiple methods that ensure its reliability (Kümbetoğlu, 2008). For this reason, in this qualitative research, which seeks to understand the social interactions of people in a localized area in terms of agricultural knowledge, I collected data through participant observation, the work and talk technique, in-depth and in some cases focus group interviews, spontaneous conversations and taking photographs indoors and outdoors to capture the everydayness of the area. I learned that Thursday is the day when farmers most frequently visited the pesticide dealers, cooperatives and the district agriculture office in the center. Interaction was at its highest level on Thursday as the neighborhood bazaar was set up there. On Thursdays, I returned home later than usual, wandered around the bazaar, listened to conversations to capture interactions, spend more time in pesticide dealers and cooperatives.

Photograph 6-8: Views from inside of particular pesticide dealers – “All pesticides are harmful to human health”

In addition to this, I accompanied agricultural engineers on their lunchtime walk near to the bazaar and observed the interaction of farmers with agricultural engineers on the streets. I kept field notes and a researcher's diary on a regular basis. I observed the differences of interactions to made audio recordings during the interviews with permission. I recorded street voices during my market visits. I used some of the visual data I took in the villages as supporting elements in my critical analysis. I stopped conducting interviews when I started to identify repetitive patterns in the production, dissemination and use of agricultural knowledge.

During the fieldwork between April 13 and May 20, I stayed in Geyve every day between 09:30-19:30. The reason why I chose this time period is that it is the most frequent time of interaction between Geyve farmers and experts regarding agricultural production. Seedling, plant protection and nutrition calendars (spraying and fertilization) and decision-making processes related to agricultural production are strongly on the agenda of farmers in April and May. In order to examine the interaction in situ and to carry out participant observation effectively, exploratory questions were asked to farmers about the information they use while making agricultural production decisions and to experts about the advice they give. Within the knowledge triangle, the study examined the agricultural knowledge production processes of experts who produce scientific knowledge and who are seen as experts in the region, the ways in which expert knowledge is conveyed to farmers, what farmers do with this information and how they make decisions by producing their own knowledge, and the mutual effects of digitalization in all these knowledge flows. I emphasize that information is not a neutral entity and does not accumulate neutrally while constituting knowledge. In this context, exploratory questions were asked to reveal the mutual construction of science, technology and society by inquiring hierarchy of the information sources, the economic, political and historical dimensions of such hierarchy, the impact of capitalization, gender and geography on generation, extension and utilization of information, the impacts of digitalization- delivering big data-driven information on experts' advices and the decision making of farmers and how such social responses impacts digital agriculture itself.

6.2. Table of participants

I interviewed a total of 27 farmers and 15 agricultural engineers (details are explained in sample chart below). While the interviews with male farmers that took place in village coffeehouses spontaneously multiplied and intertwined with instantaneous interviews, the interviews I conducted at the district agricultural directorate and on the mountain were determined as focus groups in advance. The tables below show the demographic characteristics of the interviewees and variables related to their agricultural production.

Table 6-2: Distribution and number of participants

TABLE OF PARTICIPANTS													
Subsystem	**Geography**	**Features**											
Agricultural Producer	Location	Neighborhood	Name of Farm Family	Land Size (owner+rent acre)	Crops				Gender	Name	Education (Level of school)	Age	Relevance of Digitalization in case of digital-climate station (Receiver of data driven information)
					Cereal	Live-stock	Veggie	Fruit					
	Lowland	Safibey	Zengin Family	400	-	-	Tomato Pepper Zucchini Spinach Celery Cauliflower	Quince Cherry Grape Peach	Male	Ali	Secondary	53	+
									Female	Fatma	Primary	52	-
			Arslan Family	250	Wheat oat, vetch	Cattle	Tomato Pepper Spinach Celery Cauliflower	-	Male	Mehmet	Secondary	35	+
			Aydın Family	150	wheat	Cattle	Celery Spinach Cauliflower Tomato pepper	-	Female	İlknur	Primary	40	-
									Female	Sare	Primary	60	-
		Bayat	Bayat Family	150	-	-	Tomato Pepper Spinach Celery Cauliflower	Quince Cherry walnut	Male	Polat	High	35	+
									Female	Meral	Secondary	36	
			Öztürk Family	450	-	-	Tomato Pepper Zucchini Spinach Celery Cauliflower	Quince Cherry walnut Grape Peach	Male	Nusret	High	71	-
									Male	Burak	Primary	51	+
									Female	Nazlı	Primary	50	-
			Gürler Family	150	-	-	Tomato Pepper	Quince Grape	Male	Nihat	Secondary	35	+

							Spinach Celery Cauliflower		Male	Abidin	Primary	61	
			Özcan	150	-	-	Tomato Pepper Spinach Celery Cauliflower	Quince Grape	Male	Mümtaz	Secondary	52	+
		Umurbey	Hayati Family	150			-	Quince Grape	Male	Bekir	Primary	54	+
		Doğantepe	Şirin Family	100	-	-	Tomatopepper	Quince Grape	Male	Cafer	Secondary	65	+
			Kaya Family	100	-	-	Tomatopepper	Quince Grape	Male	Doğan	Secondary	53	-
	Mountain	Akdoğan	Taş Family	150	+	+	peas beans chickpea	Grape Cherry	Male	Furkan	University	35	-
									Male	Ferhat	Primary	60	-
									Female	Zeynep	AssocDegree	37	-
									Female	Hatice	Primary	60	-
		Çine	Yemiş Family	200	+	-	peas beans	Grape Cherry Quince Plums Apple	Male	İsmet	Secondary	40	+
									Male	İbrahim	University	57	+
									Female	Ayşe	Primary	56	-
		Halidiye	Kezban Family	150	+	+	peas beans chickpea	Grape Plums	Female	Rabia	Primary	50	-
			Nadiye Family	160	+	+	peas beans chickpea	Grape Cherry	Female	Havva	Primary	47	-
			Meryem Family	160	+	+	peas beans chickpea	Grape Cherry	Female	Hacer	Primary	35	-
									Male	Reha	Primary	35	-
[redacted]													

Research (All in lowland)	Type of Organization	Name of Organization	Profession	Farming experience	Gender	Name	Education	Age	Relevance of Digitalization in case of digital climate station data driven information: Sender	Receiver
	Public Institutions	District Direct. of MAF	Agricultural Engineer	-	Male	Levent	University	39		
				+	Male	Lütfi	University	38		
				- -	Female	Esra	University	35		
				-	Male	Mahir	University	30		
		Provin. Direct. of MAF	Agricultural Engineer	-	Male	Metin	University	44	+	
	Self-Governing	Beet Growers Cooperative	Agricultural Engineer	+ (fruit and vegetable)	Male	Kaan	University	39	+	
			Agricultural Technician	+ (fruit)	Male	Necati	Associate Degree	44		
		Chamber of Agriculture	Agricultural Engineer	+ (fruit and cereal)	Male	Oğuz	University	32		
		Agricultural Credit Cooperative	Agricultural Engineer	-	Male	Hasan	University	44		
	Private Companies	Pesticide Dealers – Dealer x	Agricultural Engineer	+	Male	Recep	University	46	+	+
		Pesticide Dealers – Dealer y	Staff	-	Male	Mustafa	High	46	+	+
		Other actor – Dealer z	Agricultural technician	-	Male	Mehmet	Associate Degree	68	+	+
		Distribution Firm	Agricultural Engineer	-	Male	Haşim	University	45		
		Company Representative	Agricultural Engineer	-	Female	Leyla	University	35		

Table 6-3: Distribution and number of participants

In-depth interviews on socialization of agricultural knowledge				
Subsystem		Gender		Subtotal
		Male	Female	
Agricultural Producer Subsystem	Lowland	11	5	16
	Mountain	5	6	11
Farmers		16	11	27
Research Subsystem	Public Institutions	4	1	5
	Self-Governing Organization	4	-	4
	Private Companies	4	1	8
Experts		12	2	14
TOTAL number of participants		28	13	41

6.3. Steps of qualitative data analysis

In data analysis process, I follow Adu's (2019) guide for qualitative data coding steps and thematic analysis stages. In order to effectively integrate my participant observations into the analysis, I completed the transcription each of the 43 interviews within three days. While I organized transcripts, I read them several times and noted my initial ideas. To begin with, I identify key actors of socialization of agricultural knowledge in Geyve as experts (agricultural engineers, agricultural technicians) and farmers. Experts are separated in terms of their working place respectively as public institutions, NGO's and private companies. Public institutions include district agriculture and provincial agriculture, while NGO's include Beet Growers' Cooperative, Agricultural Credit Cooperative and A Chambers of Agriculture and private companies include pesticide dealers, distributors and traders, and company representatives. Moreover, farmers associated with agricultural knowledge and information are basically differentiated in terms of geography and gender. Farmers are separated by considering lowland-mountain, female-male distinction. In addition, I indicated the demographic information of all participants, production information and their relationship with digitalization in the participant table as you can see above. When the transcripts were finished, I placed the files in the actor categories.

Generation of codes, categories and themes

As Saldaña (2016) states a code comes before a category and a category precedes a theme. I followed Adu's (2019) guideline for qualitative data analysis of ethnographic studies in the process of data-category-theme construction. While creating the data, I determined labels taking into account the discussions in my theoretical framework and my research questions to identify relevant information in the data. Since I conducted ethnographic research, I used the interpretation-focused coding strategy of Adu (2019) develops. First of all, I matched words, expressions, phrases with these labels, reorganized these matches by interpreting them within themselves, and finalized the code for the relevant information identified. In Geyve, there are different institutions that produce and deliver data-driven information to farmers. Yet, agricultural decisions are not solely depended on information delivered from digital climate stations. Data-driven information is integrated into information networks in complex ways and have implications of socialization of agricultural knowledge and information.

7. FINDINGS

Climate change has been posing significant challenges on agricultural production. To ensure the continuing agricultural activities, farmers must effectively manage the risks posed by severe weather events. On the other hand, while climate change exerts numerous stresses on agriculture, agricultural activities also play a pivotal role in driving climate change. Industrial agriculture has a significant contribution to global warming, accounting for one-third of the greenhouse gas emissions (Crippa et.al.,2021). In simple terms, one of the sectors most impacted by climate change is agriculture yet it is also one of the main drivers behind it. Hence, the task of providing food for a rising population on a world with limited resources become one of the most challenging efforts. Farmers must make increasingly complex decisions on land utilization, seed selection, crop cultivation, and livestock management in response to the impacts of climate change. Digital agriculture is one of the solution proposals that aims to help farmers in their decision-making processes and ensure sustainability in agricultural production. Within the scope of this technology, it is expected that big data-driven information enables farmers to reduce the use of chemical inputs and prevent crop loss by making the right decision at the right time. In other words, big data driven information obtained through digital sensors is expected to empower farmers in combating the uncertainties caused by the climate change. In the literature, discussions on how this technology should be transferred to farmers, its technical possibilities regarding ensuring sustainability and data security are mentioned. The literature on agricultural information and knowledge systems, which I reviewed in the previous chapters, is consisted of discussions focusing on rationalization of farmer's decisions and the ways of transferring scientific knowledge. These studies are conducted with quantitative approaches and measurements. In the majority of these studies, key actors of the agricultural knowledge and information system are identified and surveys are conducted to measure the efficiency of information flows. In this main, agricultural information is considered as an entity that can be detached from social relations and transferred between actors. Based on this understanding, with the quantitative findings obtained from these surveys, deficiencies in information and communication networks are identified and suggestions are made to improve transferring of scientific knowledge and technology to farmers.

Taking the co-productionist approach of STS which basically claims that technology and society are mutually constructed, I argue that science and technology is communicated through complex social relations and negotiations. I argue that agricultural knowledge is not a neutral entity that can be smoothly transmitted, but rather it is mutually transformed through social relations. Therefore, instead of focusing on how agricultural knowledge is “transmitted”, I consider how it is “socialized”. I claim that this could be achieved by *socialscientification* of the agricultural information systems literature dominated by agricultural engineers. In accordance with this framework, I use Foucault's conceptualization of power/knowledge which claims that technological development and scientific knowledge are emerged through particular power relations, emphasizing that power is relational and constantly reproducing through social relations including forms of resistance. Based on this conceptualization, I attempt to examine the struggle between expert knowledge, which is accepted as scientific knowledge and farmer knowledge by revealing the mechanisms through which acceptances and resistances are realized. In other words, I attempt to explore how agricultural knowledge is socialized through what kind of power/knowledge struggles between farmers and experts and analyze the implications of digital agriculture by focusing on how big-data driven information is communicated between which actors, in which ways.

As I discussed in the previous sections, one of the most widely used digital agricultural technologies in Turkey is digital climate stations. These stations as decision support systems are implemented to empower farmers and underpin the sustainability of agricultural production. I chose Geyve for fieldwork as it is one of the important agricultural centers of Turkey and is undergoing a digital agriculture transformation through the implementation of digital climate stations. Within a Foucauldian power/knowledge perspective, I attempt to understand the socialization of agricultural knowledge in Geyve and the implications of digitalization on it. By doing this, I also aim to evaluate to what extend digitalization is able to underpin sustainability in agricultural production. To reemphasize, I formulate my research questions for fieldwork as follows:

- In which ways agricultural knowledge is socialized through what kind of power/knowledge struggles in Geyve?
  - In which ways power relations are maintained, through which mechanisms they are reinforced?
  - In which ways resistances are emerged, through which mechanisms they are reinforced?

- What are the implications of digital climate stations on socialization of agricultural knowledge in Geyve?
  - In which ways it is involved into power/knowledge struggles?
  - To what extend it underpins sustainability in agricultural production?

During the five weeks of fieldwork, I conducted in-depth interviews with both experts and farmers in Geyve. I interviewed with 14 experts from public institutions and private companies. I also conducted 27 in-depth interviews with farmers and in order to maintain an inclusive representation rate, I selected male and female participants from different regions with different scales of production. I also conducted participant observations at the institutions, companies, fields, gardens and markets. After transcribing the interviews, I code the significantly repetitive expressions in the interviews to capture relevant patterns. I create mind maps to show these patterns and the relationships between them. I address power relations, forms of resistance in the socialization of agricultural knowledge and implications of digitalization in separate mind maps. The maps of power and resistance differ significantly in terms of the mountain/ lowland distinction. Therefore, it is required to generate four different mind maps to show the power and resistance in the lowland, the power and resistance in the mountain, and the integration of digitalization into these struggles. The participant expressions that form the patterns were expressed in original colours. The statements of female farmers in the lowland are colored orange, while those of male farmers are light blue. Due to the fact that interviews on the mountain were conducted with the collective participation of farm families, statements featured in green in the form of the words of farming families. Finally, the patterns in the interviews with advisors are also added to the maps, with public sector employees represented in grey and private sector employees in yellow. Field observations are represented in purple, located next to the relevant statements. The statements are also supported by photographs from the field. The relationships between the patterns are expressed with arrows showing strong and weak linkages. Lastly, during the analysis, I used some abbreviations[27] in brackets to describe who the actors are, their age, which institutions or villages they belong to.

7.1. Lowland

During my field visits, I consistently approached Geyve from the north due to my designated road route. The Geyve Strait was the first thing to greet me. As Dağlı (2005) indicates that Evliya Çelebi referred to this region as the "Sea of Trees," surrounded by the captivating Samandağ Mountains and meandering Sakarya River. While journeying through the lowlands, vineyards, orchards and farmlands stretched in a continuous line along my path. I used to take long walks in the peasant market on Thursdays, often stopping between the stands to listen to the farmers' conversations among themselves. I spent some time shopping and had short conversations with the farmers. In this way, I became acquainted with the village names and the farmer's voice. In the first days, I often rolled down the window of my car to inhale the sweet scent of the fig trees. When I crossed beyond the center, I saw rising slopes. These stony, dusty roads invited me to climb the mountain. As I travelled up to the mountain, I used to wait for herds of goats and sheep to cross the road. I witnessed how the goats lightened the burden of the branches of the pomegranate tree with a single bite. Those were the early days of the field, I was wandering in the shell of Geyve. As Sakarya River continues to meander and the mountains continues to rise, I was observing the time pass and greeting living life of Geyve. After a while, I took a deep breath and dived into it, peeling off its shell layer by layer. The first layer is consisted of the District Directorate of Agriculture and agricultural pesticide dealers in the lowland. In order to unravel the power/knowledges in the socialization of agricultural knowledge, it was necessary to understand the forms of engagement between expert knowledge and farmer knowledge. I needed to find out what kind of knowledge was accepted as “expert knowledge”, how this acceptance was constructed and under what conditions it was produced. In addition, by interviewing the experts, I would be able to access the farmer registration system (ÇKS) due to my ethics committee permission and select farmers according to my sample.

[27] Private Experts - Pest.dealer: Pesticide Dealer, Company.Rep: Company Representative, Beetgrow.coop: Beet Growers Cooperative, Agricredit.coop: Agricultural Credit Cooperative, / Public Experts - Dist.direct: District Directore of Ministry of Agriculture, Provin.direct: Provincal Directore of Ministry of Agriculture

7.1.1. Exploring power relations

As discussed in previous chapters, according to Foucault, power is diffused and embodied in certain forms of knowledge. He claims that power and knowledge are inextricably linked, continuously involve each other (Foucault, 2003:35). There cannot be a power relationship that does not constitute a certain kind of knowledge and in the same way there cannot be a certain kind of knowledge that does not constitute power relations. He claims power/knowledge struggles are emerged in the process constructing "regime of truths" by organizing what counts as "truth" through mechanisms of inclusion and exclusion (Foucault, 2005:52). I assert that the socialization of agricultural knowledge takes place through the construction of certain set of truths, through mechanisms of inclusion and exclusion. In this context, I aim to figure it out through which mechanisms of inclusion and exclusion the definition of agricultural knowledge is formed and through which relationships and power/knowledge struggles it is socialized. In the mind map below, it is possible to see the patterns specific to the power relations in the lowland, the connections between the patterns and the expressions of the actors[28].

[28] Agricultural engineers are referred as experts or consultants in the literature. The same adjectives are used in this study. In Geyve, I realized that institutions that experts are working are basically divided into public and private based on whether they sell chemical inputs or not. Hence expressions like "public experts/advisors" "private advisors/commercial consultancies" are used.

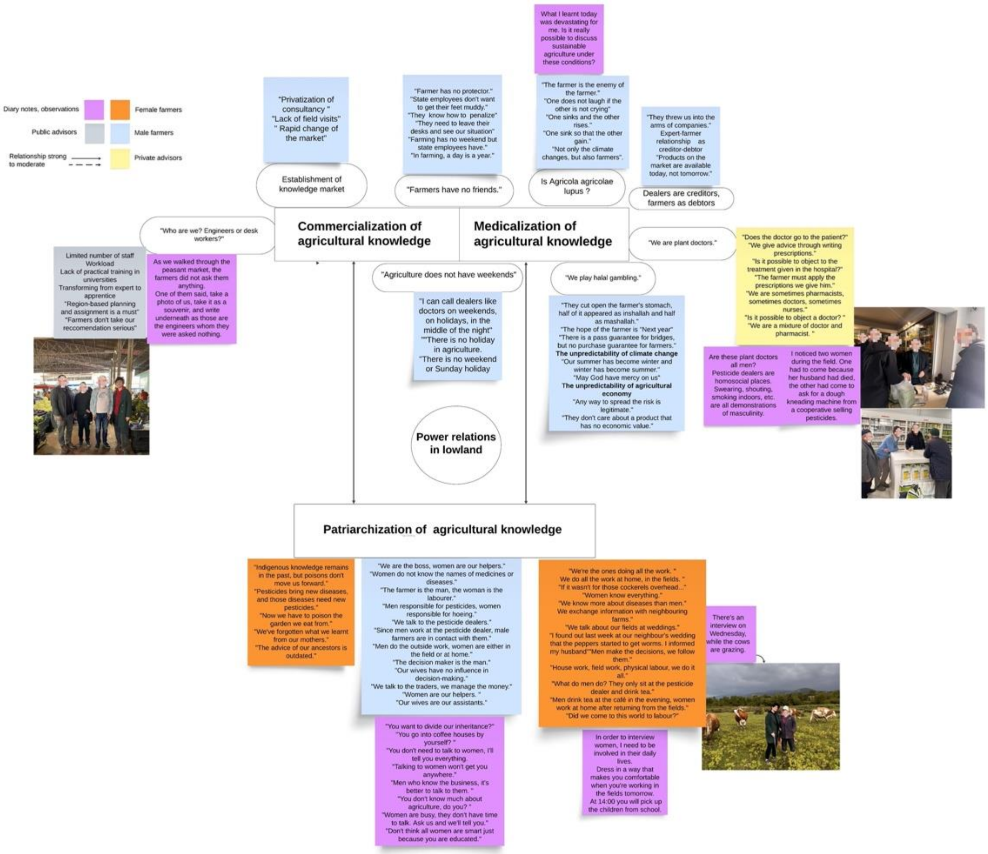


Figure 7-1: Mind map that shows patterns related to power relations in lowland

I firstly planned to conduct interviews with agricultural engineers working at the public institution, the district directorate of the Ministry of Agriculture. As it is a public institution, I could easily explain to them that I was working at the university, conducting scientific research and in this context, I needed to conduct in-depth interviews with them and access farmers from the ÇKS.

7.1.1.1.Commercialization of agricultural knowledge: The construction of expert knowledge based on appropriationism and its transformation

During my interviews with the engineers in the district agriculture, the engineers were in a hurry to calculate agricultural incentives. All of the interviews took place at the desk, they did not make any field visits. During the interviews, public advisors frequently emphasised this deficiency. They mentioned that they could not make field visits, that they were burdened with paperwork due to the limited number of employees and that they had turned into desk officers. They also stated that they could only provide information mostly when farmers came to the office. Mahir (30, district direct.) putted it this way: “Even I myself forget sometimes, if I’m an agricultural engineer or a civil servant? We have to deal with documents so much that we don't have time to visit fields." Having stated that farmers already do not ask many questions to them, public advisors mentioned that they are not considered as "an expert" by farmers. According to them, the main reason is current system's view that regards agricultural engineers as civil servants. In other words, they stated that the current state policies do not train public advisors as a guide to lead the farmers, not as a source of information that stands by farmer side but as desk clerks. They mentioned that there are basically two mechanisms that weaken the connection between public experts and farmers namely the training of agricultural engineering faculties and the centralized appointment system.

Firstly, it is remarked that without adequately testing the theoretical knowledge that agricultural engineers learn from the university courses, they immediately become busy with paperwork in the directorates of the Ministry. Participants claim that they start desk jobs without practicing the theoretical education they received at the university and thus they had difficulty in bridging the gap between theoretical and practical knowledge. They strongly emphasize that agricultural education in university should not be separated from field visits and applied courses. Levent (39, district direct.) expressed this as follows: "Is it possible to be an agricultural engineer without stepping on the soil? It happens in the current education system. It is foreseen that we are supposed to deal with the paperwork and trained as civil servants, not as farmers' friends." Lütfi's (38, district.direct.) words corresponded with Levent's statements: "We graduate without growing up in agriculture. Maybe most of us come from cities, we should see agriculture on the soil, not on paper. Increasing the number of applied courses is essential for us to understand the world of farmers."

Moreover, participants graduating from departments with relatively more applied courses frequently drew attention to centralized appointment system that leads poor connection between farmers and themselves. Participants stated that agricultural engineers employed in the state are appointed as civil servants. They expressed that students studying agricultural engineering might develop special interests due to products of the geography where they are educated. Due to the centralist appointment system of the state, they are mostly assigned to a geography where they are unfamiliar with the production pattern. Participants indicated that this created discontinuities in the knowledge formation and transform farmers into apprentices in the front of the farmers. They mentioned that basin-based production planning and basin-based appointment of engineers is required to strengthen the relationship between farmers and them. They claim that such a reorganization of the state would ensure continuity in agricultural information by allowing its accumulation and transformation into knowledge. The following words of Levent (39, district direct) helped to clarify the issue:

> Think about experts who have specialized knowledge on sunflowers in Trakya and citrus fruits in Adana. They can be appointed replacing each other as a result of the centralized appointment system Therefore, an expert with the specialized knowledge on citrus fruits can be appointed to the geography where sunflower production is dominant. In the public institution to which they are assigned, it takes a long time for them to get used to the new production pattern due to the desk workload and insufficient number of employees. When they visit the field, they feel like an apprentice, not an expert. Planned production and basin-base assignment are essential for a healthy relationship between farmers and state experts.

Lütfi’s (38, district direct.) following words also point out this issue follows:

> We had conducted field visits on walnut in my university years. I have become familiar with many diseases and pesticides of walnut. I was assigned to Geyve three years ago. It took me a long time to get used to viticulture the dominant production pattern here. It is very difficult to be an apprentice of what you are a master of. You lose confidence in yourself, and the farmer feels this. As a result, our linkages with farmers remain weak. The solution to this problem is basin-based production planning of the state and making our appointments according to this system.

Expressions such as "working at desk", "being considered as a civil servant", "not being considered as an expert", which are frequently mentioned in the statements of public advisors, are actually an outcome of the historical transformation of Turkey's agricultural extension system. As discussed in the previous sections, agricultural education at university and high school levels in Turkey has been structured under modernization of agricultural production since the establishment of High Agricultural Institute in 1933. The framework of agricultural scientific knowledge and its extension has been drawn to reinforce to appropriationism[29] in agricultural production and to promote input-intensive agriculture. In this context, use of agrochemicals is accepted as a given, not questioned but rather encourages in agricultural production. Starting from university years, the sources of information used by experts, their research and are designed to prioritize increasing the yield and profit maximization in production. In other words, in terms of scientific knowledge of experts, set of truths of intensive

[29] A term first employed by Goodman, Sorj and Wilkinson (1987) in relation to the forms in which agriculture is industrialized; the application of science and technology to intervening in the rural production process through the manufacture and deployment of new agricultural input as such fertilizers, pesticides, seeds, etc.

agriculture is accepted. In the pre-1984 period, the production and dissemination of this accepted expert knowledge was carried out with a more applied course-oriented and public dissemination approach. While practical and theoretical courses were given together, this knowledge was demonstrated to farmers practically during field visits and field days organized.

With 1984 reorganization of the Ministry, the protectionist policies of the state that train the agricultural engineer as a friend of the farmer were withdrawn. Public extension started to weaken and advisory systems are started to be commercialized which led extension delivery systems from supply driven to demand driven. In other words, the content of expert knowledge is remained the same as appropriationism - oriented, but the way of its access changed. The state official who takes the information to the farmer without any economic interest has been replaced by the farmer who goes to the consultant and purchases the information. In 1984, Turkey underwent a significant shift about agricultural advisory services from a state-led development model to a market-oriented strategy influenced by neo-liberal principles. During this era, the International Monetary Fund (IMF), World Bank, and World Trade Organization (WTO) advocated for the implementation of neo-liberal agricultural policies in developing countries through various aid programs. These policies aimed to eradicate farm subsidies and reduce state involvement in the agricultural sector and reposition farmers as customers and experts as commercial service providers. The state involvement in the production and extension of agricultural knowledge has been extremely withdrawn. Especially, the introduction of World Bank's "Agricultural Extension and Applied Research" program led to the emergence of non-governmental extension services and the privatization of agricultural advisories. Agricultural engineers have been transformed from actors representing the protectionist hand of the state to desk clerks doing paperwork and the understanding of practical education in agricultural faculties has weakened. As they were transformed into civil servants, they were also subject to the appointment systems in the civil service. Engineers who could stay in the same place for a long time and carry out field research become appointed to work in district offices through the central appointment system. Following the year 1984, there was a decrease in the activities of governmental agricultural extension services, while the private extension sector experienced growth in line with global trends (Marsh & Pannell, 1998; Rivera, 2000). The extension activities of the public engineers were degraded, engineers started to be seen as civil servants and were engaged in paperwork. With the disappearance of the protectionist relationship between the state and the farmer, the farmer is left to his own efforts to meet his information needs. As a reflection of neoliberal policies, the farmer has been re-positioned as an individual, an active entrepreneur who needs to pay to access knowledge, purchase consultancy.

As argued in the previous sections, economic interests are prioritized in the production and extension of agricultural information by commercial advisory services. In the commercial consultancies where information transfer turns into product sales, appropriationism is realized through "prescribing". According to the public experts I interview with, today’s farmers information demands are limited to acquiring knowledge about the brand names of effective seeds, fertilizers, and pesticides. As Erdoğan et al. (2019) argue, majority of farmers in Turkey today see pesticide dealers as a source of information and reduce information to prescriptions. Participants mentioned that the reduction of the content of agricultural information to agrochemical brands has led to the destruction of the counselling qualifications of public extension workers in the farmer eye. They stressed that there is a correlation between the fact that farmers obtain the information from the private sector and the fact that they are not seen as experts. They perceive it as a kind of discrediting process. They mentioned that their scientific knowledge is consisted of learning active substances against pests not the names of agrochemicals brands. They stated that farmers see the prescriptions written by commercial consultancies as “scientific knowledge” and that their information needs are reduced to pesticide brands. In the interviews, it was expressed that the agricultural input market changes very rapidly, that products are not permanent and are constantly renewed, that it is not possible for a public expert and a farmer to catch up with this speed. They remarked that in order to empower farmers against this speed, they try to support them by transferring information of active agent. They remarked that although the brand names and instructions for use of medicines are constantly changing, certain active ingredients remain same for certain diseases. A farmer with active agent knowledge can purchase and use the active agent at the rate he needs without being swung between the ever-changing market and pesticide brands and without being bound by the prescription written by commercial consultants for their own commercial interests. On the other hand, participants claim that the active ingredient-oriented information is not accepted among farmers and their information needs are fulfilled by commercial consultancies, especially pesticide dealers. They mention that private consultancies especially dealers have much closer relations with farmers than they do. Participants claim that farmers are used to going to pesticide dealers like going to the grocery store, that instead of using scientific information[30], they are subject to the brand names in the dealers and the prescriptions written for them. Although this criticism is not directly directed at using agrochemicals itself, it is about the commercialization of scientific knowledge The following words of Esra (35, district direct) exemplify this criticism:

> The market has constantly changed the names of pesticides, seeds, the course of diseases. We do not inform farmers in line with economic interests, we guide them in line with science. Commercial consultancies are, as the name implies, commercial. In other words, the transfer of information has turned into a kind of trade, a kind of shopping.

As my interviews with public experts in district agriculture took a long time one day, we had a lunch together. For this, I suggested them to go to the famous meatball shop in the peasant bazaar. My aim was to witness the interaction between the farmers in the market and the public experts. We walked through the village market and arrived at the meatball shop. No one stopped them on the way and asked questions. Levent (39, district direct.) realized that I had noticed this lack of communication between farmers and them and added:

> You see, in the eyes of the farmers, we are desk clerks, they don't pay much attention to our suggestions because production is completely market-oriented, they want to know the brand name instead of our recommendations towards learning the active ingredients. Let's take a photo as a memorial. You can write under it that 'they are agricultural engineers those who are asked nothing'.

Photograph 7-1: Public experts in peasant bazaar

Derived from the interviews, it was revealed that in lowland of Geyve, form of agricultural production is intensive agriculture which is one of the major drivers of

[30] Scientific information is defined as using the active agent by public experts.

biodiversity loss and environmental pollution, soil erosion (Tsiafouli et.al.2014). Based on capitalist mode of production, it relies on the intensive use of labour, lands, water and agrochemicals (Alexandridis et.al.2018). Farm families heavily apply improved agrochemicals such as fertilizer, insecticides, fungicides, and herbicides to grow crops and achieve profit maximization and crop yields per unit land area which puts severe pressure on natural resources. In lowland of Geyve, the regime of truth is constructed through what intensive agriculture counts as “true.”

Agricultural knowledge in the lowland is formed of appropriationism which detaches agriculture from dependence on natural resources and rationalize the production processes (Goodman,1987; Çağlar and Keyder, 2003). Ecological benefit oriented agricultural production knowledge such as agroecology, permaculture, restorative agriculture is excluded by this truth regime. Hence, standardization of natural processes related to agricultural production through agrochemicals, the use of high-yielding seeds are accepted as true. Therefore, determining the content of expert knowledge as appropriationism-oriented constructs and reproduces the power of intensive agriculture. Yet, such scientific knowledge or in other words expert knowledge has been reduced to prescriptions as public dissemination has weakened and commercial consultancies have come to the fore. The information conveyed to farmers consists of instructions for the use of agricultural pesticides. Like participants pointed out, appropriationism oriented knowledge has been commercialized. In other words, it has established close links with market relations. Farmer's information need is reduced to prescriptions that are written by commercial advisors as such pesticide dealers. In Geyve today, it is clearly seen that although public extension activities partially continue, farmers are engaged with knowledge market. As a result of the historically transformed agricultural structure, the relationship between the state and the farmer has weakened and the gap has been filled by commercial advisors. Public experts are trained as civil servants through their training and appointment systems which weakens their links with farmers. Public advisors perceived this weakness as "not being taken into consideration", "not being seen as an expert", "being trained like a civil servant", "being appointed like a civil servant", "being a desk worker", " becoming an apprentice while being an expert" and stated that their knowledge, recommendations are not given the credit by the farmers as it is given to commercial advisors. To understand the claim of public experts that the information needs of farmers are reduced to prescriptions and to discover how the scientific knowledge of commercial consultants is formed, I started interviewing with commercial consultants.

Establishment of knowledge market

In my interviews with commercial advisors, I first asked them about the sources of the advice they gave to farmers. Most of them showed me the "user manuals" of agrochemicals delivered to them by the distributors. They indicated that neither textbooks nor Ministry publications are significant in their interactions with farmers. They mentioned that the most commonly used sources of information are the booklets and brochures containing the instructions for use of the pesticides and the trainings given by the company representatives. They stated that their prescriptions are formed according to user manuals of agrochemical companies by emphasizing that following the user manuals is a real effort in itself. Expressions of Recep (46, pest.dealer) who advises many farmers in the region show put it this way:

> Chemicals used in agriculture are regularly renewed. In fact, some pesticides and seeds are renewed every year like cell phones. Even if the active agent is the same, the brands change. As the brands change, the way they are used also differs. During the sale, distributors give us the user manual of the relevant brand and publications related with related chemical. After reading and understanding it, we formulate our prescriptions according to this new information. It is a big effort.

Similar to Recep, Kaan (39, BeetGrower coop.) expressed that he mostly uses introductory document of distribution firms as information sources when advising farmers. He indicated that there are certain diseases in the region which requires certain active agents and these active agents can be formulated in different ways by different licensees in order to increase productivity. He stated that agrochemicals change very rapidly and therefore they can only follow the user manuals distributed by the companies from which they purchase inputs. When farmers come to the dealer, they describe the situation in their fields and gardens, sometimes they bring some pieces with them, sometimes they show photographs. The expert formulates the prescription based on this narrative.

Photograph 7-2: A farmer showing shows the disease on a leaf to a commercial advisor

Mustafa (46, pest.dealer) explained the ways of writing prescriptions as follows:

> In order to get a guaranteed result, we usually direct farmers to implement a little more than written in the brochures. Farmers are waiting to earn money from the harvest for the whole year, we can't risk it. If I reduce the amount of pesticides and fertilizers and lead a product loss, at the end of the season the farmer will come and blame me. Here, no one cares about environmental damage, the first concern is preventing economic loss.

Derived from interviews with commercial advisors, it is revealed that transformation of appropriationism oriented knowledge takes place through prescribing. I noticed that the content of agricultural knowledge is reduced to pesticide brands and instructions for use, as pointed out by experts in district agriculture. As stated above, there are criticisms in the literature about prescriptions written by pesticide dealers are often prepared based on the farmer's declaration without technical observations in the field (Labarthe and Laurent, 2013). The statements of Mustafa, Kaan and Recep who are commercial advisors in Geyve strengthened these criticisms. Sharing the same opinions with them, Hasan (44, agricredit.cooperative) asserts without seeing the agricultural disease or pest itself on the field, he is able to offer related products. Hasan explained how he makes decisions when advising farmers as follows:

> I listen carefully to the farmer and try to understand the problem. It is clear to some extend which diseases might originate in this area. In order to understand the problem closely, I address some directive questions to farmers. If I am convinced by his answers, I formulate my prescription, if not, I go to the field and make observations. When I encounter a situation that I cannot solve, I contact with company representatives or distributor company. They do the necessary research and inform me so that I advise the farmers.

Expressions of commercial advisors also justify the criticisms of Klerkx and Jansen (2015) towards privatization of consultancy which point out the fact that experts do not provide comprehensive technical help through regular farm visits. They write prescriptions without conducting fieldwork to observe the production conditions. To ensure the sale of inputs and maintain the fidelity of producers, the dealer must provide high-quality services by proposing solutions that guarantee high efficiency. Stock and Forney (2016) claim that with the rise of commercial advisory services, farmer's need for information is met by matching the profit of the dealer and thus creating a *knowledge market*. They point out, with privatization of consultancy, delivering information to farmer transform from being a supply driven service to demand driven. The properties of neoliberalism as such "individualism" and "autonomy" are attributed to farmers and they become entrepreneurs that are responsible to find the most accurate information for themselves in the knowledge market. On the other hand, the fact that prescriptions are ultimately determined by the market and that farmer is forced to use agrochemicals on the shelf renders him not a rational “individual” or a “customer” that can purchase the service he wants. Statements of Mehmet (48, pest.dealer.) enlightened such contradiction as follows:

> We can help the farmers as much as they demand. If they do not come, we cannot go to them personally every day. When they come, they may not find the product they are looking for. For example, the farmer says ‘give me the blue medicine I bought last year.’ Which one? The name, substance and packaging may have changed this year. We cannot keep track of that. We can provide them whatever is on the shelf.

Klerkx and Jansen (2015) also signify in this knowledge market prescriptions are written to satisfy the farmer by leading them purchase and use greater quantity of inputs. In line with their concerns. Also, Leeuwis (2006) stresses that knowledge market is financed through the sale of particular inputs including pesticides, seeds, and fertilizer and the financing mechanism influences the expert’s suggestions. In such a knowledge market, the profitability of the firm may undermine the fulfilment of the farmer's information needs (Aktaş, 2003). In the interviews, commercial advisers, confirming this criticism mentioned that the knowledge of the prescription are determined by market relations. They stressed that the prescriptions are organized according to the agrochemicals that are on the shelf which are determined by market relations.

Photograph 7-3: A shelf of a pesticide dealer

They mentioned that they order agrochemicals they purchase before the season and write them as prescriptions to the farmers. In other words, agrochemicals to be used by the farmers consist of the products purchased by the commercial advisors and are determined from the beginning. Haşim (45, comp.rep.) put it this way:

> When there is a traffic accident, the tow truck drivers start rubbing their hands. That is also the case with us. When the climate goes a bit worse, we immediately start rubbing our hands and wait farmers to come. Pesticides make money even when it's sitting on the shelf. The chemical you buy in advance becomes expensive over time, so dealers make bulk agrochemicals purchases before season. When farmers come, pesticides are not ordered according to their declarations. Whatever is on the shelf is given.

Labarthe and Laurent (2013) mention that privatization of agricultural knowledge and as a result of business connections between customers (farmers) and suppliers (experts) environmental concerns are diminished. Sustainability is reduced to an economic term that means surviving in the market, sustaining the profits both for commercial advisors and farmers. Within this knowledge market, the sources of information for commercial advisors are mostly brochures, user manuals of the companies from which they purchase agrochemicals and farmers' information needs are met through prescriptions without field visits. Through prescriptions issued according to the farmer's declaration about pets and disease, I observe that agricultural knowledge is medicalized. Just as patients go to the doctor and explain their illnesses, farmers go to dealers and get prescriptions for their gardens and fields.

7.1.1.2. Medicalization of expert knowledge: Construction of medical gaze

In Geyve, I have observed that the relationship between commercial advisors and farmers has turned into a kind of doctor-patient relationship through the prescriptions written. In Foucauldian terms, it is possible to say that these prescriptions are dominated by *medical gaze*. As mentioned before in the discussion of objectification of scientific knowledge, the medical gaze is established by objectifying scientific claims, relying on the authority of modern medicine based on credibility and reliability. Foucault argues by treating patients with medical gaze, doctors reconstruct a narrative to match a biological viewpoint, treating them more like a collection of separated components than as a whole (Foucault, 1991). In the interviews with commercial advisors, it is revealed that they are often assigned particular personas to themselves such as doctor, plant doctor or agricultural doctor and that the transfer of knowledge is organized in a top-down, one-way manner. They see themselves in such positions as doctors, nurses, pharmacists or psychiatrists in their relations. Intensive agriculture which is the form of agricultural production of lowland and which is based on rationalizing and controlling agricultural production is reinforced by promotion by medical gaze. It is possible to identify medical gaze in the following words of Recep (58, pest.dealer):

> We work like medical practitioners. Like a doctor, we identify the plant's disease and prescribe it. Like a pharmacist, we provide medicine. Like a nurse, we perform the treatment when necessary and when the farmer feels hopeless, we support him psychologically like a psychiatrist to improve his state of mind. In this way, we try to transfer our knowledge to the extent of the farmer’s capacity.

Similarly, in the following words of Leyla (35, company rep.), it is possible to detect medical gaze and the establishment of one-way information flow.

> We are plant doctors, experts of agriculture. We know what is in the medicine and its function. Today, when a patient goes to a hospital, do they question the medicines given by the doctor? Farmers should be like this. We use the language of doctors, we express what is scientifically correct. If they followed everything we say, many problems in agriculture would be solved.

Mehmet (48, pest.dealer) also confirmed the authority of medical gaze and establishment of one-way information flow with his following words in agreement with Sevim and Kaan:

> Phenomology is never wrong. If you do agriculture without basing it on scientific knowledge, you cannot reach a result. The medicines we offer to farmers are licensed as a result of long-lasting research. Yet, we face problems because our prescriptions are not applied correctly by farmers.

Hasan (44, agricredit.coop.) also mentioned that agriculture resemble medicine and following words: “All the prescriptions we write have a basis. These medicines are licensed depending on the R&D studies of the companies. We are essentially agricultural doctors, we are responsible for transferring this information to farmers.”

Mustafa (46, pest. dealer) also agreed that agricultural engineers resemble doctor of medicine and added following words:

> Agricultural engineer and medical doctor have the same point of view. In the past, the university scores of the two departments were equal. Like human beings, agriculture is alive. Plant, water, animal, soil, we are their doctors. We write prescriptions and give medicine like a doctor. To conduct a proper farming, farmers need to apply our recommendations.

The medical personas that interviewees assign to themselves increase the power of prescriptions that reduce agriculture's dependence on natural resources, control its unpredictability and discipline its processes. As in medicine, these prescriptions fragment and reconstruct a narrative to match a biological viewpoint, treating them more like a collection of separated components rather than as a whole. This makes the transmission of information one-way, reinforces the authority of commercial advisors over farmers, and ultimately reinforces the accepted truths of intensive agriculture that are maximizing profit and efficiency. In these interviews, the commercial advisors concealed the fact that they are the dominant actor in the knowledge market and that prescriptions are determined by market relations. They emphasized the medical context of the word “prescription” but not mentioned that market relations are embedded into medical gaze of prescriptions. They have stated that expert knowledge is based on appropriationism, and that scientific knowledge consists of knowledge that rationalizes production, without mentioning that appropriationism is shaped by market relations through the commercialization of consultancies. In other words, medical gaze through prescription writing gives the orders of capitalist mode of production the appearance of objectivity.

To explore how expert knowledge is experienced by farmers and understand emerging power/knowledge struggles in depth, I continue to conduct in depth interviews with farmers. For this purpose, I received help from the district agricultural directorate in line with my ethics committee permission. I selected the farmers I could interview in the lowland from the farmer registration system by random sampling method. In addition, in order to accurately represent the universe of Geyve farmers, this randomness was limited to a certain extent. I also asked the commercial advisors to refer me to farmers. They opened their databases to me and I enriched my farmer sample with the selections I made. Both public and private advisors told me that the form of production differs in the lowland and in the mountains, hence I organized the random selection to include lowland and mountain. They also stated that the phone numbers of male farmers are registered in the system and it is very difficult to reach female farmers. They emphasized that in the lowland, farmers are seen as men and women work in the fields as labourers. I realized that in order to reach women, I had to go to men first, meet them through interviews, gain their trust and persuade them to take me to their spouses. It was time to put into practice the methods I had learnt as a woman researcher from other studies to combat masculinity without interfering with the course of the research. I dialed the first number on my list.

Next morning. Geyve Strait. The sound of the Sakarya River. Then the smell of figs. On the navigation, Safibey's coffeehouse, one of the villages with the highest agricultural production capacity in the lowland. After the first greetings and ordering cup of teas, the first question that I would encounter many times later came: "Are you an agricultural engineer?". I can express that the identity of a researcher who does not farm creates both advantages and disadvantages in the field. This identity allowed lowland farmers to talk about "agricultural engineer" without limiting themselves and enabled them to explain their thoughts in detail "for me to understand". On the other hand, the fact that I am not an agricultural engineer and also am a woman, led especially male farmers and advisors to want to intervene in the course of the field and to show off their mansplaining in which this respect, I was challenged. I had to struggle to avoid directives and questions such as "You don't need to go to that village." / "If you want to talk about agriculture, we will find a farmer for you." / "Are you travelling alone?" / "Women are generally not interested in agriculture, so you became interested much later." / "Don't go to coffeehouses alone, call us and we will accompany you." / "Can you drive? How will you get there?". It was usually useful to tell them that I was working at the university, sometimes I give short answers, sometimes just ignore the directions.

"Farmers Have No Friends": The example of cauliflower seed

On the table where we were sitting in the Safibey coffeehouse, there was an advertising brochure for a cauliflower seeds whose efficiencies was praised. I learned that the company representative had left it the previous day. Farmers in the coffeehouse were talking among themselves about this seed. I started the conversation with them by asking if they were thinking of ordering this seed. A few remarked they were thinking of trying it and a few remarked that they were waiting for the results of district directorate’s declaration towards cauliflower subsidy.

Photograph 7-4: Advertising brochure for a cauliflower seed was left on coffeehouse of Safibey

Mehmet (35, Safibey, Lowland) stated that the advisors at the District Agriculture had announced subsidies for cauliflower and that he was thinking of receiving it even though it was problematic. He explained what this problem is in the following words: "Public experts don't speak Turkish, they don't understand our language" he replied and added: "The state treats its farmers as stepchildren." The participants mentioned that even a simple cauliflower subsidy was carried out without considering the needs of the farmer, that the planting time was passing and that information on which company and seed would be contracted was not announced. It is frequently mentioned that farmers have been deal with both ecological and economic uncertainties to survive and public experts are not aware of this. They mentioned that the state was unaware of the farmer's situation, did not even know how farmers are striving to survive.

Ali (53, Safibey, Lowland) expressed that through the cauliflower subsidy, it can be seen how the farmer is abandoned. Stating that farmers develop various tactics to survive in the market conditions, Mehmet pointed out that the engineers working in the state are detached from the agricultural truths, they do not know the market and what they say does not find a response in farmers.

> They should get up from their desks before giving us advice. They don’t know understand our truths. It should not be so difficult to give a cauliflower subsidy. A day is a year in agriculture. Is this how little they know about us? If you delay sowing for a day, the yield of a year will decrease, if you treat the disease a day later, it can spread to the whole product.”

For example, choosing early or late varieties is one of these methods. Harvesting a product that is rare in the market increases the market value of the product and enables the farmer to earn more money. This tactic is also applied to cauliflower. Early or late varieties are mostly planted in the region, so there is no overlap with cauliflower harvests in other regions of Turkey, and cauliflower is priced well in the market. In line with this tactic, agricultural pesticide dealers use lists to determine which farmers require which seeds and seedlings in advance, and the products are supplied according to market conditions. As the announcement of state support for cauliflower cultivation is delayed, the option to be included in the lists of agrochemical dealers disappears, which puts enormous pressure on farmers. Ali (53, Safibey, Lowland) remarked that a few days ago, twenty farmers suddenly withdrew from the state support and “ran” to the dealers and added:

> District directorate made us pleased at first by declaring cauliflower seed subsidy. Then there was no follow-up. I am thinking of withdrawing from this subsidy, I explained the situation several times, they remarked that the negotiations with the companies are ongoing. We don’t have time for this. We speak Turkish, they don't understand. They are stalling.

The cauliflower example shows the weakness of communication between public engineers and farmers. Farmers stated that public engineers do not understand their world and do not speak their language. Moreover, the pattern of "the state leaving the farmer on his own" and "not understanding his situation" “being treated like stepchild” are also associated with the discourse of " penalizing". In the interviews in other lowland villages, it was mentioned that state employees do not make field visits and that their purpose in going to the field is to "impose fines". Polat (35, Bayat, Lowland) stated that he rarely saw engineers from the district agriculture department in the field, and when they are in field, farmers especially avoided greetings and continued as follows:

> Their only purpose is to take samples and issue fines, if you greet them, you will be in debt." He stated that the public advisors did not make any attempt to meet the information needs of the farmers during production and continues as follows: “If I do not

> use pesticide, I lose money, I would not be able to produce. Will the state cover my losses? No. Will they guide us about using pesticides? No. Then it should not fine me either. They don't understand the situation of farmers?

On the same day, I also witnessed a dialogue on this issue in the peasant market. I overheard two farmers talking on a spinach bench. One of them was angry with the engineers at the district agriculture department and remarked the following words:

> The only thing they know is to punish so that their feet don't get muddy." His expression as he threw the spinach on the bench was: "The state has thrown us into the arms of dealers, forcing us to obey them. Dealers have the latest model car; what do farmers have? We are struggling to survive.

Neoliberal policies implemented as a result of the historical transformation in the organization of agricultural knowledge are experienced by farmers in the form of being " abandoned", "left alone", "treated as a stepchild", "having no friends". The state-farmer relationship, which weakened as a result of withdrawal of etatizm from the field, experienced by public experts as not being "seen as an expert", "expert no questions asked", "actor writing penalties" and by farmers as becoming " abandoned", "stepchild" and "friendless". This gap has been filled by commercial consultancies. farmers said that commercial advisors fit into their working lives and that staying in contact with them was very important for farmers to see their advice and prescriptions as credible.

"Agriculture does not have weekends."

As mentioned before, during the fieldwork, along with interviews, I spent time in dealerships and participant observation. The following short spontaneous conversation with Orhan, who was waiting for his prescription to be written in a pesticide dealer illustrated how commercial experts have filled the gap caused by the weak link between public engineers and farmers:

> I work with this man (pointing to the agricultural engineer at the dealer). He is always with me. On weekends, on holidays, in the middle of the night when I have something on my mind. There are no official days in agriculture. He doesn't do what the district agriculture officers do, he answers your call, and if you are in a very difficult situation, he comes when you call him.

The continuity of information and communication networks of commercial advisors is the most important factor that strengthens farmers' interaction with commercial advisors. Commercial advisors filled the gap created by the withdrawal of the state by maintaining constant communication with farmers and adapted their working hours and rhythm of work. commercial specialists are in constant dialogue with farmers to minimize the impact of farmers feeling unattended, like stepchildren and without friends The following words of Bekir (54, Lowland, Umurbey) illustrated it:

> Who should we ask our questions to? Those in the district agriculture do not follow the market, they do not know the medicines. Everyone has their own dealer. In agriculture, a day is a year. When the disease is seen to start, it is necessary to intervene immediately, if you do not intervene that day, a year's labour is wasted. We need people who can show us what to do immediately and they are the pesticide dealers.

Ali (53, Lowland, Safibey) supported Bekir's words as follows:

> It was an Eid morning. I saw red spiders in the tomato field. I thought, "How is this going to happen on Eid day? I called my druggist. The man came before the Eid prayer, opened the shop and gave me the medicine, would you believe it? It was a public holiday of public experts. Can you reach them? Agriculture has no public holidays."

The words of Burak (51, Lowland, Bayat) also overlapped with Ali and Bekir:

> When the farmer is in the field, he cannot see some things, he cannot identify them himself. During their visits, the representatives of the company I buy seed from recognize diseases and pests that I cannot see. They warn me about worming saying that they saw it on my field and recommend medication. I buy my seed and fertilizer from them once again next year. If the experts want to support the farmer, they will go to him without him asking. Druggists[31] win because they do this.

Polat (35, Lowland, Bayat) agreed with the other participants:

> "There is no holiday in agriculture. There is no weekend or Sunday holiday. It is not a job that can be done with a civil servant mindset. Those in district agriculture work like civil servants. There is no weekend in agriculture. Farmers do not have weekends. Civil servants do. Our times and lives do not correspond to each other. Farmers can always call their druggist, they work on weekends, too.

Doğan (53, Lowland, Doğan) expressed the interaction of farmers with commercial advisors as follows: "We can always ask questions to the dealers. We stop them when we see them on the street, we go and sit next to them in the mosque."

In addition, communication through digital channels is as important for farmers in the lowland as face-to-face communication. Communication between farmers and commercial advisors is frequently conducted through Facebook and WhatsApp. 24/7 accessibility of private experts cause farmers to feel safe and tied them to prescriptions. Recep (46, pest.dealer) remarked his interaction with farmers:

> Farmers know that they can reach me 24/7. I cannot tell you how many phone calls I make a day. If they can't reach me by phone, they send photos on Whatsapp and get information. I try to respond to every question. It is normal to be called at 12 o'clock at night, if you do not answer, the farmer will be offended. I closed my Facebook so as not to damage

[31] He indicates pesticide dealers.

> my relationship with the farmer. I can't follow those who send me messages via dm, they get offended when I don't reply. Staying in touch makes them feel safe.

Ali (53, Lowland, Safibey) explained the confidence of being able to ask questions to the farmer as follows: "I even call my dealer by video. Or if I see a disease, I take a photo and send it. It is comforting to find answers to my questions, it means you have a supporter."

On the other hand, the situation of " being side of the farmer" is not valid for all farmers. It was observed that the situation of "dealers being on the side of the farmer" has certain limits. Cafer (65, Doğantepe, Lowland) remarked such limits as follows: “Dealers are with you as long as you have money. He thinks of himself first, then you. It's a commercial enterprise. If you don't have money in agriculture, you have no friends.” Nihat (35, Bayat, Lowland) also mentioned these limits as follows: “Farmer can't survive if the dealers don't handle us. They generally can’t afford to pay cash to write prescriptions, I owe my dealer for the next year. But I pay my debt, I don't shop from anyone else but him.”

As discussed above, it is claimed that with the commercialization of agricultural advisory services, the relationship between farmers and experts has turned into a customer-service provider relationship (Stock and Forney, 2016). Within the knowledge market generated by commercialization of advisories, delivering information to farmer transform from being a supply driven service to demand driven. Yet, I observed in the field that this transformation not exactly have been emerging like this and that the farmer-expert relationship has turned into more of a debtor-creditor[32] relationship.

Dealers are creditors, farmers as debtors

Due to their purchasing power, large-scale farmers can decide on the agrochemicals to be used in production and negotiate with different firms. They can interrupt the one-way information transfer of dealers and compare different options. In other words, as their production capacity increases, farmers have more say in commercial information and communication networks. In other words, as the amount of inputs purchased increases, they can engage more in production relations, interact with more firms, and compare the information they purchase. Ali (53, Lowland,

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[32] Alacaklı-verecekli ilişkisi

Safibey), one of the large-scale farmers in the region realized that firms pay special more attention to them as follows:

> Firms are afraid to prescribe something that would make us lose money. They know that other companies chase us. This is a race. He writes me the most accurate prescription so that I can make money and trust his knowledge. In this way, I will go to him next year, choose him, and make him earn money. The druggist work with is also sensitive to our questions. They never miss a visit when we call them. They endeavour to please us. But if we did not have money, if we were obliged to beg and bow to them, they would not show this interest in us.

Burak (51, Lowland, Bayat), also one of the large-scale farmers, points out that the most important facilitator in accessing information is purchasing power and added following words: "We do not kneel down in front of druggist, companies. They come to us and give us gifts so we can try their products. We buy whichever gives effective results. In other words, they throw out a sprat to catch a mackerel[33]."

However, as purchasing power and production volume decrease, the farmer's dependence on the commercial consultant from whom he buys products increases and his capacity to question decreases. Especially small-scale farmers with low purchasing power frequently stated that they are not able to compare the prescriptions of dealers and search for products. For example, Cafer (65, Lowland, Doğantepe) expressed this situation in the following words:

> I mean, you cannot ask questions freely. Wherever you bought the seed, you asked the question to that dealer. It is like debtor-creditor relationship. Otherwise, they say you didn't buy the seed from me; don't ask me the question. It would not be appropriate. They do not show us the respect they show to big farmers.

As the purchasing power of the farmers decreases, their indebtedness to the firms increases, and they develop obligatory loyalty to them under this debt burden which deepens the debtor-creditor relationship. Mümtaz (52, Lowland, Bayat) explained this situation as follows:

> If my land was big, companies would come to me. They would give me gifts to work with them. But we can only survive on our own. We owe the money for the next year from the dealers. When the money for the harvest comes, we pay off that debt; we don't have much cash in our pockets. When the dealer handles you, you can't go to anyone else but him. If he sees you going to someone else, he will stop handling you. He has the power. He has the latest model cars, and he has the money. We have turned into farm labourers.

Bekir (54, Lowland, Umurbey) expressed his views about the limitations of dealers being their side with the following words:

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[33] "Kaz gelecek yerden tavuk esirgemezler."

> "Are these dealers in the state? No. They have to think about their own interests. Besides, they also handle us. For example, my son got married last year, I remarked I would not be able to pay my debts, I blushed. He remarked fine, you'll pay when you're able to. Now, can I go anywhere else but to this man? We are tied to dealers's apron strings[34]. If we were rich farmers, maybe they would come to us; then we would have the chance to make a choice; now we almost do whatever he says."

However, the fact that small scale farmers are deprived of the possibility to question expert knowledge to a large extent as Bekir put it like they almost do whatever commercial advisor says, is not only related with emerging debtor-creditor relationship. The speed of market changes is a major obstacle for farmers to accumulate knowledge and experience with agrochemicals. The rapid change in market relations embedded in the prescriptions of commercial advisors increases the power of these experts over farmers, making the transmission of information one-way. Haşim (45, company rep.) mentioned that even as a distributor company representative whose job is to sell products to dealers, he had difficulties to follow the changing pace. He noted that at such a fast pace, farmers are unable to go against pesticide dealer's word and cannot make decisions on their own and continued with these words:

> Licenses for pesticides are constantly being developed and the market is constantly renewing itself. Instructions for use, pesticide names and their packaging do not remain constant. In this rate of change, farmers do not have a choice other than acceptance of the dealer's direction. Those who do not properly apply the prescriptions, cannot make decisions to earn enough money.

Farmers who have difficulties following the constantly renewed market, have less space to question the prescriptions written, and can turn into passive recipients. Discourses such as "There are no products we know", "If you ask which medicine you used last year, there are very few." show how information cannot be accumulated knowledge and remained as a purchased entity. Mümtaz (52, Lowland, Bayat) illustrated it as follows:

> You get used to a certain seed; they say that this year that seed was not produced. By the time you reach the level where you can measure the effect of a medicine, the name of the medicine changes, the instructions for use change. I guess these medicines are as fashionable as mobile phones or clothes. Makesure you don't get used to them. You remain a stranger; you don't understand. You have to follow the poisoner's instructions. If you don't, there will be a doubt in you, wondering if you are doing the right thing. You obey for your own comfort.

Doğan (53, Lowland, Doğantepe) expressed his views on this issue as follows:

> Whatever is on the dealer's shelf is all there is. Do we have the chance to make a choice? There is no point if you say, "I used this medicine last year, I want that medicine." Nothing good will come from questioning it. Dealers say companies did not produce it. You can

[34] "Biz onlara göbekten bağlıyız."

> have information as much as they give you. We have come to the point where we would spray water if they gave us water. We have no other choice.

Mehmet (35, Lowland, Safibey) reminded the example of cauliflower and stated the following sentences:

> There is a cauliflower seed we have been planting here for a while. Its name is Casper. It is white, you know the ghost in a cartoon film, white like that, it adapted very well here. We used to buy it every year. This year they remarked there was no Casper. How come? Are they deliberately not bringing the seed that adapts to us? Farmers got used to it, they figure it out which input is best for this crop. Therefore, farmer's need for information decreased. I think that's the reason we can't find Casper; they changed the seed. If he says there is none, what could you do?

Derived from interviews, it is revealed that the dependence of prescriptions on market relations creates discontinuities in agricultural knowledge. The brands and instructions for use of chemical inputs may terminate and change due to market relations. While the accumulation of experience that comes from using a product for a long time may enable farmers to question the prescriptions, the rapid change of input products eliminates this possibility. The accumulated knowledge and experience that may arise from long-term use would provide farmers opportunity to question prescriptions and undermine the authority of medical gaze that gives scientific objectivity to market relations. Yet, fragmented information that does not accumulate and does not turn into knowledge strengthens the power of commercial advisors on farmers. However, it is also noted that farmers do not perceive the pace of change in the market and the uncertainty of access to agrochemicals as uncertainties in themselves, but rather that farming itself is full of uncertainties. They experience the risks of the transformation of such social relations, including weakening relations with public experts, increasing pressure of commercial consultants, together with economic and ecological risks.

"Farming is halal gamble: Half Inshallah, half mashallah"

Farmers perceive limitations of the continuum of agrochemicals as a part of a larger uncertainty. The claim that they are already in a risk environment where "everything is uncertain and constantly changing". Ecological uncertainties caused by climate change, economic uncertainties caused by the free market are mentioned together in the interviews. Keyder and Yenal (2020) point to the prevalence of the "gambling" metaphor among farmers in Turkey. They argue that this term refers to the decline in public spending on agriculture and farmers' dependence on food markets. This statement was also found in the field study in the context of agricultural knowledge. Participants referred this ambiguity as a “halal gamble” and frequently expressed that to survive in this gamble, they try to make decisions based on reducing costs and increasing profits and that ecological interest is not taken into consideration. The most striking statement in this regard came from Doğan (53, Lowland Doğantepe):

> The farmer here does not love nature. They do not love each other either. The farmer is at the bottom, the rush to make money has ruined everyone. The climate is changing, the market is changing, risks are increasing, the consequences of wrong decisions are financially severe. If it doesn't make money, the farmer will cut down his planted fruit trees without blinking an eye.

Participants frequently stated the “unpredictability” of this gamble by stressing that not only climate changes but also the agrochemicals, prescriptions and product prices are constantly changing, that farmers have difficulty in foreseeing tomorrow. Mehmet (35, Lowland, Safibey) explained this situation in the following words: “They cut open the farmer’s stomach, half of it appeared as inshallah and half as mashallah. If you are lucky, you say mashallah, if you are not, you say inshallah next year. You never know what will happen.”

To deal with economic and ecological uncertainties, farmers claim that they spread risk to win in the halal gamble. It is observed that spreading the risk is associated with planting different crops in the season thinking that if one product does not make money, the other would and not sowing crops that does not bring money in one season after the other. It is observed that this seeking strengthens the reduction of agricultural knowledge to a focus on appropritonism and its socialization by making farmers more dependent on private advisory services. The participants experienced having to spread the risk as being "left on their own", "left to manage on their own", and associated the state's ignoring their situation by "not making crop planning" and "not providing purchase guarantees" with being placed at the gambling table. Following words of Mehmet (35, Lowland, Safibey) illustrated such correlation:

> "The production pattern in the country is determined according to the whims of the farmer. The state does not plan for it. A crop that is a hit one year is a disgrace the next year; become unprofitable. The market value of the crops cultivated in different regions becomes competitive with each other, and one of them always loses. Farmers were made to sit at the gambling table. For example, Geyve is known as the capital of quince. Today, farmers started to cut the quince. Last year, the year before that, they gave them to junk dealers[35]. It doesn't make any money. Why? Denizli quince is on the market; their quince is worth money. What does Geyve's farmer do? He started to cut down his quince trees without blinking an eye. Is it easy to grow a tree? Peach and date palm trees are

[35] In Geyve, farmers call fruit juice companies as *junk dealers*. Fruits that do not make money are sold to fruit juice factories at the base price. Mehmet points out that quinces have been given to fruit juice factories for several years.

> planted instead of quince, farmers think they would have greater market value. These are not the products we know, we are dependent on dealers, companies. It is not clear whether they will adapt or not. We will see in five years.

The following opinions of Cafer (65, Lowland, Doğantepe) support Mehmet's words:

> Before quinces, there were apples in Geyve. It used to bring good profit. Then apples shifted to Niğde. Ours did not make money. We cut all the apples and plant quinces. Now it's not a good profit. There are people planting walnuts, dates, and nectarines instead. We'll see how it goes. We are on our own, left to the mercy of the companies. For example, one of my friend's dates turned out to be a fruitless date. It is difficult to grow a product you don't recognize; you do what firms, dealers say; my friend had purchased the incorrect seedling, the one with fruitless, how would he know?"

It is observed that the orientation of the farmer, who changes his product pattern due to economic uncertainties and trying to grow crops which he is unfamiliar with resulted in discontinuities in agricultural knowledge and increase the authority of commercial advisory services. Since being unfamiliar with the crops also comes with being unfamiliar with its knowledge, it causes farmers to become passive receivers of prescriptions to a large extent and reinforcing the top-down information transfer.

Furthermore, in this "halal gamble" farmers make decisions to mitigate the risks created by ecological uncertainties by rationalizing production processes through applying agrochemicals. For this reason, just as economic uncertainties make farmers more engaged with commercial advisors, ecological uncertainties increase farmer-commercial advisor interaction, making it the primary factor shaping socialization of agricultural knowledge. Participants mentioned that agriculture is becoming more unpredictable with climate change which leads them to make wrong decisions. They mentioned that they tend to use more agrochemicals in order to minimize such wrong decisions and errors. These strategies for coping with ecological uncertainties also increase the power of commercial advisors and reproduce the medical gaze of prescriptions. The power of these prescriptions and the medical gaze has become so strong that the local knowledge of the farmer, indigenous knowledge has become an invalid, nostalgic item. Farmers stated that they prefer prescriptions instead of "ancestral knowledge" and that "old agriculture is a thing of the past". An example of this can be seen in the following words of Mümtaz (52, Lowland, Bayat):

> Ancestral knowledge is no longer useful. Because medicines are very effective now. In the past, we used to wait for Hıdırellez to sow. Or the phases of the moon used to be observed. Now no one takes these into consideration. Today, there are many methods: you can put more pesticides in the soil, or you can grow your crops under a veil. No one makes decisions according to old knowledge here.

The following words of Bekir (54, Lowland, Umurbey) supported Mümtaz:

> The old methods are outdated. Our winter has become summer, and summer has become winter. Ancestral knowledge is no longer valid. The farmer produces according for the market. For example, in the past, it was remarked that the field should not be plowed when it is wet. Today, those who plowed the field when it is still wet apply more pesticides on it, harvest the product earlier, and earn more money.

Nusret (71, Lowland, Bayat) expressed another view that " ancient knowledge is outdated":

> The knowledge of our time is no longer valid today. Last year, the wheat in the lowland turned black. There was a disease. Dealers and companies could not find a solution. Finally, one of the young people in the lowland came to me and said ‘Grandpa, you know what to do. What did the ancients do?’ I remarked ‘My child, wheat was never black in our time; this is the first time I have seen such a thing in my life’. Those pesticides must be causing new diseases. Pity all the wheat that was burned that year.

It is observed that in the establishment of the regime of truth in the lowland, indigenous knowledge is not accepted as “true” and referred as an " outdated" source of knowledge. It is understood that profit-oriented agricultural production puts oppression on farmers to consider that this knowledge is no longer useful, valid only remains in the past. As discussed in previous chapters, Santos (2014) defines this one-way transfer approach as an epistemicide, an extinction of a particular collection of knowledge caused by enduring structural oppression from historical, social, and political systems of domination. In lowland of Geyve, indigenous knowledge is necessarily excluded as a requirement of intensive agriculture which resulted in its epistemicide to a large extend. In the interviews, it is revealed that the knowledge used in today's world is not a continuation of the past; wet fields are being ploughed, no one follow the moon, the summer became winter and the winter became summer and “the past belongs to past”. To such an extent, the knowledge passed down from generation to generation has become worthless and useless in the reality of intensive agriculture and has turned into nostalgic elements of an old world.

The increasing commercialization of appropriationism oriented of agricultural knowledge as a way of coping with ecological uncertainties which enhances the interaction between farmers and commercial advisors, also changes farmer-farmer interactions in terms of the socialization of agricultural knowledge. As a way of dealing with market pressure, as a way of dealing with those great uncertainties farmers may hide information, spread disinformation and mislead in order to increase the market value of their products. In this sense, the discourse of "the farmer has no friends" is reproduced in the socialization of agricultural knowledge among farmers with discourses such as "the farmer is the enemy of the farmer" and "the farmer is not the friend of the farmer".

Is “Agricola agricolae lupus”?[36]

With the commercialization of advisories, through farmer-specific prescriptions knowledge transfer become interpersonal. In the previous sections, it was stated that before 1984, when public extension was active, public agricultural engineers and technicians often informed the farmers in the village collectively. It has been mentioned that through mass media such as radio and television, information flow was transferred from the expert community to the farmer community through mass communication tools that this transfer was independent of commercial interests. The Ministry of Agriculture used mass media to spread appropriation oriented agricultural knowledge to increase productivity. 4-K group meetings in villages, the radio programme called " Teacher of Agriculture Speaks" conducting demonstration days, publications and broadcasts delivered to the village coffehouses are examples of the collective transmission of agricultural knowledge. Today, the farmer turns into a kind of entrepreneur in terms of accessing to knowledge (Leeuwis, 2006), commercialization of agricultural knowledge leads ascertaining the farmer as a participant and cost-sharing agent in agricultural knowledge market. With neoliberal understandings of entrepreneurialism, the emphasis of “individualism” and “autonomy” were attached to farmers by putting emphasis on participation and farmers unique needs (Forney and Stock, 2016).

This individualization may cause the socialization of agricultural information among farmers to be shaped under the competitive pressure of market relations. Farmers who want to increase the market value of their products do not share the information about the agrochemicals they use and their observations with other farmers and even deliberately mislead them. Participants frequently pointed to this situation by stating that "not only the climate has changed, but also people have changed." The farmer who purchases the information does not share this information with other farmers in the village in order to maximize the benefit from it and reduce

[36] Çiftçi, çiftçinin kurdu mudur?

the risk of a decrease in the market value of the product. Discourses such as "One does not laugh if the other is not crying.", "One sinks so that the other rises.", "One sinks so that the other gains" are related to dissemination of agricultural disinformation. The following statements of Cafer (65, Lowland, Doğantepe) are important for understanding the ways in which such disinformation is disseminated and how competitive pressure of market relations shape socialization of agricultural knowledge and relationship between farmers:

> It is difficult to grow olives in Doğantepe. We have tried all kinds of medicines, but they are not working. A neighboring farmer has very healthy olive trees with good yields. When I ask him what he uses, he saysthat God has blessed him. I saw him spraying; I know he is not deliberately telling me. He thinks that he will earn more money if his olives are good and the others' are bad. There is a saying in our neighborhood that one cannot laugh without the other crying. That's how it works.

Bekir (54, Lowland, Umurbey), another farmer, explained that there is no solidarity in the villages and that the market has savaged the farmers with the following words:

> The vineyards are next to each other. Farmers hide the pesticides they use so that the next field's crop is not better than theirs. They turn it upside down and bury it in the soil, for example, so that the one next to them cannot see it. Or worse, they empty out a medicine that does not work and put in a medicine that does work. He leaves it in the middle so that his neighbours can see what he uses. That information is shared among farmers. However, what is in that box is another medicine. In agriculture, they say that one cannot be a queen before the other is ruined. There are such tricks, sad but true."

Abidin (61, Lowland, Bayat) stated the following in this regard:

> Is it only the climate that has changed? People have also changed, and farmers have also changed. There are farmers who undermine each other and become enemies. They want each other's crops to be muddy so that their crops can bring profit. There is no more old knowledge, but there are no more old farmers either.

Participants' statements such as "there are no more old farmers" and "not only the climate but also people have changed" actually show the relationship between farmers shaped under market pressure as a result of the structural transformation in agricultural advisory services. Farmers disseminate disinformation not because they are inherently bad people but as a way to combat structural problems. Today's farmer, who sees himself as left alone, thrown into the arms of dealers, who states that he is sitting at a gambling table full of economic and ecological uncertainties can turn into actors who disseminate disinformation as a way of coping with all these uncertainties. The commercialization of agricultural knowledge has not only changed the social positions and relations of the farmer and the expert, it has also changed the way agricultural knowledge is socialized among farmers. However, in the field, I have observed that such disinformation dissemination takes place between men.

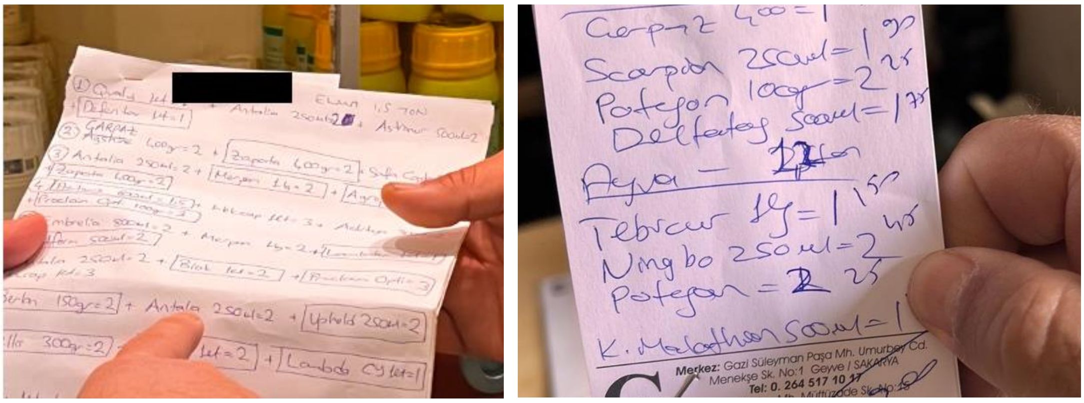
During the fieldwork, along with disinformation dissemination, I realized every day that appropriationism oriented knowledge was circulating between male farmers and male agricultural engineers. I realized that the assessments of the experts in the beginning that farmers were positioned as men and women as workers were confirmed according to my observations in the field. To understand how gender affects the socialization of agricultural knowledge, I first tried to understand how male farmers make sense of the role of women in agricultural knowledge. Discourses such as "Women do not understand how to spread risk," "We are the boss," and "Women are not involved in these matters" indicated that it was time to untie the knots of appropriation's close cooperation with patriarchy.

7.1.1.3. Patriarchization of expert knowledge: It’s a man’s world

In Geyve, pesticide dealers are places where there are many pesticides on the shelves and practices of masculinity take place inside. In this homosocial space, men who can smoke, swear and shout are surrounded by boxes of pesticides.

Photograph 7-5/7-6/7-7/7-8: Examples of pesticide dealers as male-dominated spaces

The transfer of knowledge takes place between men; male farmers and male experts talk about diseases, pests, instructions for use of prescriptions. In this way, I observe that appropriationism becomes a kind of masculinity practice. The relationship between the male farmers, who walks around with a cigarette in one hand and a bag of pesticides in the other, who help to carry the new boxes of pesticides, who try to place his prescription in his pocket to prevent it falling out, and the male advisor, who tries to respond to each question, who writes prescriptions immediately, whose phone rings frequently take place in pesticide dealers.



Photograph 7-9/7-10: Examples of prescriptions

In the interviews I conducted with male farmers, the mansplaining was realized in the form of ignoring the knowledge of women farmers and performing a kind of patriarchal epistemicide. "There is no need for you to meet with women," "women have nothing to tell you" and "women have too much work; they cannot spare time to talk" were the discourses I frequently encountered. In addition, there was a dominant discourse that “the boss in agriculture is the man” and "women can only help with the labour." Knowing agriculture was defined as understanding appropriationism, buying agricultural pesticides, following the market price of products, going to the market, earning money, and being a man. The organization of appropriation-oriented knowledge by market relations also situate men as the dominant actors in the socialization of agricultural knowledge. As discussed previously, gender codes rooted in Cartesian dualism, which associates males with culture and the public sphere, women with nature and the private sphere have been criticized by Plumwood (1993) and Shiva (1986). The patriarchy, which renders women's domestic labour invisible and declares women as the angels of the house, today declares her as the angel of the ecosystem claiming they are close to agriculture by their fertile, sensitive nature and renders her labour to the field (Plumwood, 1993). Yet, men are associated with rationality, with the knowledge of appropriationism and ultimately with "business of agriculture". Therefore, appropriationism is defined as a practice of masculinity. For example, Burak (51, Lowland, Bayat) stated that men have difficulty bending and lifting, they do not treat the crops delicately, and that women take better care of the field because they are "sensitive beings". Also, Ali (53, Lowland, Safibey) expressed that his wife is a "very good person" and that he is sorry that she works so much and added:

> My wife is very hardworking. In the morning, we take the labourers and go to the field; she works with them all day. In the evening, I take her home and go to the coffeehouse. She cleans and cooks at home. She is really good person and very hardworking. Sometimes I feel very sad that she is so tired. I try to earn money in the best way possible by following the market and make her happy.

Abidin (61, Lowland, Bayat) also associated patriarchal codes embedded in agricultural labour with women's fertility. He stated that the soil is also a mother, that women can take care of seedlings, trees and seeds as if they were taking care of children, and that men do not understand this work very well as follows: "We could not do agriculture without women. Since women are more delicate, they do the work in the field better; men's backs ache. My wife looks after the seedlings in the field like she looks after our son at home."

As can be seen in interviewees, male farmers declare female to be the angels of both the home and the ecosystem. While women provide the labour force in agriculture; rationality, decision-making, and market relations are carried out by men. In other words, intensive agriculture's the regime of truth in lowland accepts historically constructed gender-based division of labour as "true". In this way, commercialization of appropriationism oriented knowledge collaborates closely with the patriarchy and confine women to the boundaries of the field and the home. As a result of the gender-based division of labour, women are responsible for physical labour in the field, while men, as the dominant subjects in the public sphere, are responsible for rational decisions and trade. The rationality of prescriptions, the controlling power of medical gaze becomes a kind of male knowledge; it is male agricultural engineers who sells and male farmers who purchase agrochemicals through prescriptions. Therefore, appropriationism-oriented knowledge is circulated and socialized through the communication of male farmers with male experts. Thus, the historically constructed gender-based division of labour has been reproducing in the regime of truth of intensive agriculture in lowland of Geyve.

Also, patriarchal social structure is reconstructed in the regime of truth of intensive agriculture in lowland of Geyve where women's socialization is limited between the home and the field and navigating public sphere is subordinated to men. In this way, men can meet experts on the streets, in mosques, cafes, and public toilets, and they can obtain the information they need as a result of these encounters. As mentioned above, Doğan (53, Lowland, Doğantepe) emphasized the importance of always staying in touch with commercial advisors and gave the example of male farmers and male agricultural engineers' encounters in the public sphere. He stated that he could ask them questions when he saw them on the road, sitting in a café or praying in a mosque. They can also visit experts' offices, pesticide dealers, cooperatives, and companies and socialize. Recep (46, pest.dealer) emphasizes that farmers do not always come to the dealers to ask questions, but also to drink tea and socialize. Mehmet (48, pest.dealer) put it this way: "When farmers are bored, they either go to the village coffeehouse or come here. We order tea for him, have a conversation, he relieves his boredom. It is women who work in the fields, men do not visit field that much." In this way, as mentioned above pesticide dealers, who are the actors that can establish the closest bond with farmers, turn into homosocial spaces where masculinity practices are exhibited. During the fieldwork, when the assigned nature of the gender-based division of labour is questioned in the interviews, I observe that men are uncomfortable with this situation. They perceived questions as threats that would destroy the absoluteness of given nature of the division of labour and disrupt its acceptance. Examples can be listed as follows: "Are you going to make us divide the inheritance?", " What is the purpose of asking these questions?”, "You think that women can answer these questions because you are educated; not everyone is like you". Since struggling with mansplaining was destroying the flow of the interview, I decided to conduct interviews with female farmers alone while they were working in the field. In this way, I started to identify the ways in which masculine language is rejected and forms of resistance created.

In short, in the Geyve's lowland, where the mode of agricultural production is intensive agriculture, the content of agricultural knowledge has been reduced to appropriation. It is in parallel with the historical construction of scientific knowledge with a focus on increasing productivity, which is accepted as appropriationism. Therefore, knowledge on the use of agrochemicals is included and information based on agroecology is excluded. Derived from the interviews In Geyve's lowland, appropriation-oriented knowledge is socialized within the triangle of commercialization, medicalization and patriarchization mechanisms that reinforce the power of intensive agriculture.

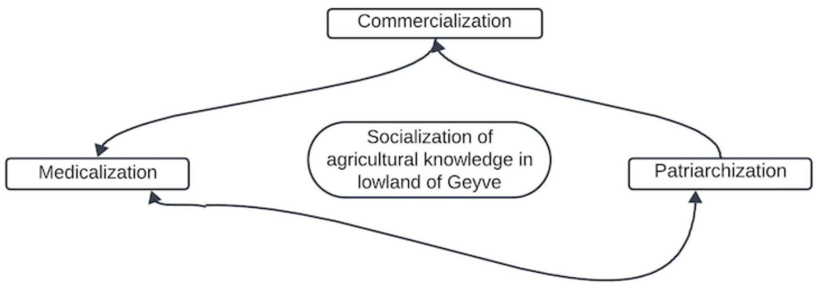


Figure 7-2: Mechanisms that reinforce the power of intensive agriculture's regime of truth in lowland of Geyve

7.1.2. Exploring the forms of resistance: Tactics of farmers

According to Foucault, social order is established within power relations that are ubiquitous and encompassing. He argues that resistance is inherent to power relations and that discourses that reject the dominant regime of truths can undermine or at least weaken any set of boundaries. As emphasized above, agricultural knowledge is not an entity that can be transferred from experts to farmers from top to bottom, but has been socialized within power/knowledge struggles. In previous chapter, I made a periodization by using genealogical analysis to highlight historical breaks in agricultural knowledge processes. In order to convey the transitions and grey areas between periods and to avoid structural reductionism, I included farmers' experiences and the tactics they developed in the face of scientific knowledge. I stated that these tactics are elements that help to preserve farmers' autonomy in social relations and strengthen their agency. I utilize the definition of agency as capacity to construction, interpretation of mean-making and making decision (Tschötschel and Jacobs (2021). During the era of widespread public extension, I elucidated the methods employed by farmers to preserve their agencies against the influence of scientific knowledge, as well as their strategies for rejecting it, drawing upon De Certeau's conceptualization of tactics. Through my analysis, I uncovered that the most commonly employed tactics were "misleading the engineer" and "asking what is known". Currently, farmers operate within an agricultural knowledge ecosystem that is characterized by limited availability of governmental extension services and a prominent presence of commercial consultancies. Consequently, the types of resistance and the strategies devised are also undergoing transformation. I consulted De Certeau (1988) and Scott (1985) regarding the evolution of strategies employed by farmers.

I observe that particular discourses and practices are emerged to undermine the authority of medical gaze and generate a transgression of the set of limits to some degree. Although this resistance is not a reontological move that creates alternative agricultural production methods that are in favor of ecological benefit, it undermines the mechanisms of domination at the discursive level. Although farmers' actions against strategies of power are not directly subversive of the dominance of input-intensive agriculture, they transform mechanisms that reinforce the power as such commercialization, medicalization and patriarchization of agricultural knowledge by the dominant order by everyday life inventiveness (Highmore,2002) and crate space for agency.

According to De Certeau (1998) strategies are formed of calculation of power relationships and produces its dominant space. On the other hand, through developing tactics individuals may manipulate the pre-determined meaning of the actions and make use of cracks and cunningly transform the operation of strategies. De Certeau argues that consumers transform meanings determined by the way they are used. This transformation of meaning also takes place at discursive level. Farmers challenge the authority of a kind of scientific knowledge through a set of discourses. In the fieldwork, it was observed that farmers developed a particular tactic “ways of language use”. Also, Scott's concept of "everyday resistance" refers to the subtle forms of resistance that individuals engage in in their everyday lives. In his book "Weapons of the Weak: Everyday Forms of Peasant Resistance", he argues that instead of organised forms of protest against authority, peasants practice subtle ways of resistance through ordinary behaviours such as "foot-dragging", "pretending to obey", "slowdowns". He explains that groups that are too dispersed to establish organised resistance protect and establish their sense of dignity, autonomy and control through these everyday, seemingly ordinary resistances against domination. Instead of large-scale protests and movements, he states that the oppressed undermine the power dynamics with daily resistances. Farmers compare the recommendations of commercial advisors with each other and find new actors as sources of information. In the process, they pretend to listen to the recommendations of the advisors, "pretending to obey". Through this tactic, they are involved in different information and networks, so that they can compare more than one prescription and recommendation. This everyday resistance is explained by "ways of interaction". Through utilizing “ways of interaction “ and “ways of language use”, farmers cunningly undermine the mechanisms of power.

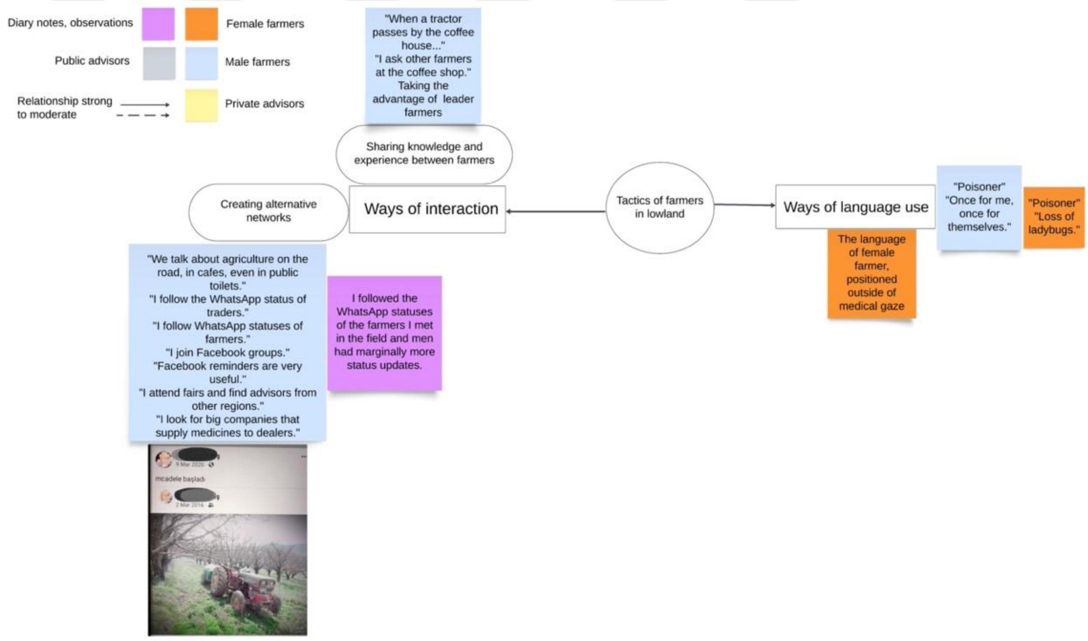


Figure 7-3: Mind map that shows patterns related to forms of resistances in lowland

7.1.2.1. Ways of language use"

This discursive resistance is consisted of women language against patriarchal expert knowledge and “druggist vs poisoner” conflict against medicalization of agricultural knowledge. Apart from these discourses, I observed that the practices of creating alternative knowledge and communication networks also constitute areas of resistance to the commercialization and medicalization of knowledge. In the mind map, it is possible to see the patterns specific to the forms of resistances in the lowland, the connections between the patterns and the expressions of the actors.

Non-Discursive Tactics: "If it weren't for those cockerels!"[37]

Dorothy Smith (1992) argues that women's experience is more grounded in the physicality of real life than men's, and that there is a certain intersection between knowledge of everyday life and women's experience. She argues that women are often preoccupied with the many details of life (such as cooking, cleaning, raising children) and that this is how they access knowledge of the ordinary. This means that women's knowledge is more grounded in the physical actions of the body. In addition to this, those "details" are precisely what allow men to live a "man's life". I came across Smith's argument when male farmers declared themselves as "bosses" and their wives as "helpers." In my field, one of the details Smith mentioned was taking care of the work in the field. The woman who engaged with the physical reality of agriculture created a unique knowledge through the observations she made in the field and this knowledge is socialized among women in unique ways. This knowledge possessed by women has been declared irrational, just as the knowledge of everyday life is not accepted as scientific and in the statements of male farmers, the woman exists as an actor who does not understand agriculture, only work to help her husband.

As Plumwood (1993) points out, the knowledge of woman who is associated with nurturing and growing is subjected to domination of instrumental rationality just as nature is subjected to domination of culture. The socialization of agricultural knowledge in the triangle of medicalization, commercialization and patriarchization leads men to ignore women's knowledge and experience, attempt to exert a kind of epistemicide on them. When I asked women about the male farmers frequent claim that "women do not understand diseases and medicines", it was revealed that such claims have no real basis. Female farmers stated that since the experts are men, their husbands speak to them, that they do not know the language of the experts, but that they recognize diseases, pests and that they use folk expressions. Since women are excluded from the production and socialization of approptionism-oriented knowledge, they create a language among themselves and circulate their knowledge through their own unique forms of socialization. Since women work in the field as a consequence of gender division of labour, they are able to make observations about ecology and give names based on such impressions. In a world under the economic control of men,

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[37] While expressing their complaints about being constantly controlled by male farmers, female farmers define men as cockerels. "Ah şu başımızdaki horozlar olmasa!"

men approach nature instrumentally and prescriptions emerge as a means of instrumental reason that controls production and maximizes profit. The medical gaze of these prescriptions declares women's knowledge irrational.

On the other, women's knowledge of living life in agriculture creates a context outside the medical gaze. Women produce new definitions and discourses away from medical gaze, as subjects who witness the living life in the field. Their language is born out of everyday life experiences. Due to the historically established division of labour, women's daily life experiences in the field are based on directly experiencing nature rather than relating to it through instrumental rationality. Agricultural labour, which is a part of everyday life, entails making observations about living life. I observe that they constructed a language outside of the medical gaze. The agricultural diseases and pests for which prescriptions are written have different names in the language of women. The male farmers and both public and commercial advisers considered these names, that lack any medical equivalent, as irrational. On the other hand, De Certeau claims that "non-discursive symbolization" which is emerged from "irrationality" can be seen as a tactic against the authority of "rationality". De Certeau's (1988) "tactic of non-discursive symbolization" is emerged in the ways of women's reorganization of rational language. Women reorganize rational language based on directs observations of the environment and based on knowledge of everyday life. Non-discursive symbolization means expressions that are not fit the grammatical scheme or chain of reasoning. It thrives the meaning from ambiguity and cleavage the institutional language modernity. Female farmers know the relevant diseases but with unique, local names they have created. These names are not credited by the medical gaze where patriarchy is embedded. To illustrate, tomato disease, known as broken back by experts, is known as "karagöt" among women. Also, the pest of the cherry tree, known as "pisilla" in the language of experts, is known as "basara" among women. The disease known as "leaf scab" by pesticide dealers is known as "kabarcık" among female farmers. İlknur (Female,Lowland, Safibey) expressed this situation in the following words: "We speak the language of the folk, if you go to a poisoner now and say 'basara', he would not understand. Yet, male farmers know expert language, are able to explain as properly."

İlknur (40, Lowland, Safibey) evaluated this situation as follows:

> How come we don't know? I am the one who works all day in the field. I am the one who sees the plant and grows it. It is men who don't know. When he comes to the field, he does not know how to look in detail. His job is spraying with the machine, preparing the ground with the tractor. They see the field as a whole, whereas we can observe even the smallest part of it because the rows pass through our hands one by one. Even though we don't know the medical names, we know them in our way. we recognise diseases even though we cannot say them like the poisoners, we know them in our own terms.

Sare (60, Lowland, Safibey) added the following to İlknur's words:

> There is nothing difficult for a man, let him get up in the morning, go to the coffee shop, visit the dealers, sit and drink his tea. We are the ones doing the labour. Those cockerels[38] think they know a lot, but we know the field better than them. When returning home in the evening, the man goes to the coffeehouse again, the woman cleans the house and prepare dinner. They already do the spraying and fertilizing in the field with machines and tractors, it is not a very tiring job. Women can do it too if they want to, but there is no time for that anymore. Oh, if it weren't for the cockerels! Without us, the world would starve.

The ways of language use of women emerged as a “non-discursive” tactic in De Certeau’s terms against medical gaze. Although the medical gaze, in which patriarchy is embedded, tries to subject women's language, knowledge and experience to a kind of epistemicide, women have created an alternative discourse positioned outside this perspective. In this sense, its absolute authority and disciplining power, in which masculinity that is associated with expertise and rationality due to the gendered division of labour, is in close cooperation, is broken by the unique discourses of women farmers. Women's knowledge, which is a result of the gender-based division of labour, and the forms of socialization of this knowledge create a reality outside both medical and masculine gaze.

The gender-based division of labour which confines women between the fields and the home also led to the socialization of women's language and knowledge in their own unique way. Female farmers stated that they talk to each other while hoeing in the field, taking care of the plants and exchange information about the living life in the field. In women's lives restricted to the fields and the home, the places of socialization are doorsteps, home visits, and fields. When there is a pause for work in the fields, neighboring women farmers have conversations. They exchange information about the situation in the field in their own language and discourse. Likewise, when returning home in the evening, the observations and information about the climate, soil and crops are communicated between women in front of the doors. In addition, women farmers also exchange ideas about agricultural production at weddings and during guest visits.

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[38] She referred male farmers by the expression of *cockerel.*

The disinformation dissemination followed by male farmers to spread risk does not take place in the socialization of agricultural knowledge between female farmers. Fatma (52, Lowland, Safibey) expressed this situation in the following words:

> If women cannot come together, it is because of work. Housework, cleaning, field work, cooking. Women know everything. We can talk a little bit with other women at weddings and guest visits There, we talk about our fields and warn each other. For example, I learnt at the last wedding that the peppers had started to get worms. Did we come to this world to work?

Also, Meral's word (36, Lowland, Bayat) is similar to Fatma's:

> This is on men's mouth. As if they can do it. He grows the field and plants tomatoes, then he can't manage that field, so he pulls a grill on the tomatoes. He prescribes the wrong pesticide, and the next year the disease infects his garden. This is no business. Everything would be better if they left it to women.

Furthermore, as discussed previously, women are less alienated from nature than men as a result of historically constructed gender-based division of labour (Shiva,1986). Due to this fact, they become the actors who transfer knowledge based on experience from generation to generation, and they have become the guardians of indigenous knowledge, the local custodians (Nazaera, 2017). On the other hand, I observed that this claim is not valid in the Geyve's lowland. Female farmers, just like male farmers agree that it is impossible to farm without input appropriationism. Even though their discourse and language are situated outside the medical gaze, they have accepted the power of appropriationism oriented knowledge and accepted the "truths" of intensive agriculture. They think that the use of agrochemicals is essential in combating the uncertainties caused by climate change. They also claim while old knowledge is a thing of the past, today's medicines and diseases are constantly changing, and that farmers can neither stay in the past nor move forward, but are stuck in between, in limbo. The following words of Nazlı (50, Lowland, Bayat) show this acceptance:

> Agriculture is a wavy sea. You never know what will happen. In the past, we did not put poison in the ground for our own food, now if we do not put poison there, we cannot get a product. In the past, we used to throw the ashes of the wood we washed clothes on the grapes, there would be no disease. Now it is impossible, the climate has changed, everything has changed, we have to do it.

İlknur (40, Lowland, Safibey) remarked the following on the subject:

> We apply the poison, and next year there is another disease or pest that the poison does not help. It is not possible to get rid of it. We have forgotten the information we learnt from our mothers; they are useless anyway. Poisons change every year. Diseases are

> changing every year. So let me tell you that we are in limbo. We can neither go back to the past nor go forward. In between, in limbo.

Meral (36, Lowland, Bayat) also accepts from the beginning that agricultural production will fail unless there is chemical input use: "Everyone is spraying pesticides, so what if you don't? Diseases and pests we don't know come out. The knowledge of the past is gone, today's agriculture is different, if you don't poison, you won't get a crop." Sare (60, Lowland, Bayat) described the state of being in limbo as follows:

> There used to be the old moon and the new moon. We used to sow the seeds on the old moon. Now there are no such calendars anymore. They spray the seeds sown on the new moon with pesticides, they did that to the beans last time, they get an early crop and put it on the market. Next year another pesticide, another seed. Neither backwards nor forwards.

Alternative discourses used by women in the lowland can be seen as a moment of refusal of patriarchal epistemicide, a form of discursive resistance in Foucauldian terms to some degree, as they stand against the masculine rationalization and medicalization of agricultural knowledge. Yet, such resistance is not focused on transforming intensive agriculture or its accepted truths, the regime of truth. The image of the female farmer as local custodians of indigenous knowledge mentioned in the literature who preserves it and leaving as a heritage for future generations has no corresponding in the Geyve's lowland.

Poisoner-druggist conflict

Another conflict at discursive level in socialization of agricultural knowledge is revealed as “poisoner- druggist” duality. Interviews with commercial advisors reveal that in terms of socialization of agricultural knowledge, commercial advisors assign themselves medical personas such as doctors and pharmacists. As noted above, large-scale producers internalize this medical gaze to a large extent due to the fact that they do not experience the disadvantages of the commercialization of advisory services. Commercial consultancies, dealers and company representatives as service providers position these farmers as customers with high purchasing power. In this way, knowledge transfer can be demand-driven and farmers can choose products that they think will provide maximum economic benefit. Large-scale farmers see their relationship with commercial advisors as a service purchase to rationalize production, reduce and control risks thereby increase profitability. Farmers who benefit economically from their relationship with commercial consultants regard these actors as “druggist” and agrochemicals as “medicines”. Input-intensive agriculture is not seen in relation to the ecological destruction it causes, but as a kind of disciplinary mechanism that controls economic and ecological uncertainties and eliminates risks with drugs and prescriptions. The following words of Ali (53, Lowland, Safibey), a large-scale farmer, illustrate this discourse:

> I set aside certain areas of the field as a testing ground for the companies, we try new medicines together. They give me particular medicines as a gift, my fields are big, I try some of medicines on the areas I speared, the benefits of the pesticides are different, you need to find the most suitable one for you.

On the other hand, Burak (51, Lowland, Safibey), also engaged in large-scale production, had the following words about the distinction between poisoners and druggist:

> Poisoner, is that what they say? Ignorant people say that. What does poisoner mean, it doesn't sound nice. After all, these are medicines to eliminate diseases and pests in the soil. Don't you use medicine when you are sick? It's the same. The soil is alive, it gets sick too.

However, male farmers whose scale of production is more limited and female farmers, who do not have direct relations with dealers have established the discourse of "poison" and make a counter persona attachment of "poisoner" as a form of resistance. Creating a counter-discourse as a De Certeau’s tactic is emerging as attaching counter assignment to the pesticide dealers against their medical-based personas such as “doctors”, “druggist”, “pharmacists”. De Certeau's transformation of meaning at discursive level is emerged in transformation of rational logic of prescriptions claim agrochemicals as “medicines”. Farmers who are aware of the discourse of rationality, which attributes objectivity to capitalist imperatives, has turned the discourse of "medicine" into "poison". They stated that the agricultural chemicals sold are not medicines, they are not a “medicine but a necessity to continue production”. This reorganization of the language moves farmers from the position of docile clients of commercial advisers and transform the relation between signifier and the signified. The expression of “poisoner” can be seen as a reflection of farmer’s anger against the withdrawal of the state from the field, the high commercialization of consultancies and their confinement to the knowledge market. Signified “pesticide dealer” as druggist is transformed signifier “poisoner”. While male farmers focus on the commercialization of prescriptions, women focus on the biodiversity loss.

Therefore, gender-based division of labour is also embedded in such resistances. The following sentences of Mehmet (35, Lowland, Safibey) are important in understanding how the discourse of poisoner is constructed by male farmers: "Poisoners once work for themselves and once work for me. Would they prescribe three boxes of antibiotics instead of prescribing a headache pill? They would. Because they want to sell more poison, they want to make more money." Similarly, Polat's (35, Lowland, Bayat) following words are also important for understanding the resistance established through discourse: "There is no need for such flattery, neither druggist nor doctor. The man sells poison and makes money. The more he sells, the more money he makes. That's how it is. Two plus two equals four." Mümtaz’s (52, Lowland, Bayat) following words show the discourse of poisoner established through the commercialization of consultancies: "After the rains, you need to throw poison on the field. You go to the poisoner and tell him. He sends you with a bag of poison. He writes multiple poisons on your prescription when one might be enough for you."

As discussed earlier, due to historically constructed gender-based division of labour, women become less alienated from nature than men. Due to this division of labour, women are able to witness the life of living beings more than men and closely observe the destruction of the ecology caused by agrochemical applied to the soil. The “poison” discourse of women is founded on these observations through ecological destruction. The following words of İlknur (40, Lowland, Safibey) are important in this respect: "There are no ladybugs anymore. They used to land on poppies and daisies. The poisons we threw killed them all." The following observations of Nazlı (50, Lowland, Bayat) are also important to show the foundation of the discource of “poison”: "Weeds we don't recognize have started to grow, and other things grow when we poison them. They are literally selling poison to us. We can no longer grow the weeds we used to pluck. Even birds don't eat these weeds." The discourse of "poison", "poisoner" “poisoners” which I frequently encountered in the interviews can be seen as a counter-discourse as a tactic that undermines the dominance of the prescriptions that give objectivity and rationality to the commands of appropriationism, destroying the disciplining power of the medical gaze, and to a certain extent.

7.1.2.2. Ways of interaction

Village coffeehouses, tea and resistance

Beeley (1971) mentiones that in Turkey the long-established coffeehouses in the villages (which first appeared in some Turkish villages during the last years of the Empire, began to spread more rapidly after the establishment of the Republic in 1923) is an informal meeting place for men where business can be transacted and news and information exchanged. The coffeehouse is the social meeting place among the man in traditional rural society in Turkey. As for socialization of agricultural knowledge, just like pesticide dealers, they are emerged as homosocial spaces where information transfer takes place between men. Male farmers regardless of production scale come together in village coffeehouses and exchange information and experience about agricultural production. Male farmers share their satisfaction with the prescriptions they use, their observations about dealers, companies and the products they buy with each other while drinking tea, playing games or reading the newspaper. The "farmer experience" that shapes decision- making processes is one of the elements that interrupts the top-down transfer of expert knowledge. Nihat (35, Lowland, Bayat) mentioned that farmers make decisions based on the conversations in coffeehouses and pointed out that village coffeehouses are one of the most important spaces for the socialization of agricultural knowledge as follows:

> Men usually spend time in the coffeehouse, women in the fields. Men don't visit the field much except when pesticides are to be applied or when the soil is to be plowed. They either go to the poisoner to drink tea or come to the coffeehouse and play games. At that time, he asks, for example ‘Mehmet Abi, what are you going to plant this year, is there any pests on the grapes, what is the condition of the leaves on the quince’. Farmers share their experience and opinions; all important decisions are made in the village coffeehouses.

The following remarks by Bekir (54, Lowland, Umurbey) also illustrate the importance of village coffeehouse in the socialization of agricultural knowledge and their role in empowering farmers against dealers:

> Farmers those sitting in the coffeehouse compare their poisoners. Conversations like ‘what did your poisoner say, what did the other’s say, are you going to throw those pesticides away, I will do this instead’ take place. At the end of these conversations, if the farmer thinks that there is too much poison in his own prescription, he goes to the dealer and asks him ‘why did you prescribe me this’, ‘why did you prescribe me that’ He shows the poisoners that he is awake.

Mehmet (35, Lowland, Safibey) put the importance of coffehouses in terms of socialization of agricultural knowledge this way:

> If you say yes to everything the poisoners say, they treat you like a sponge. They say 'he takes whatever we give him'. they think that if they give the farmer water, he would apply it to his fields. In order not to be like a sponge, we learn a lot in consultations held in

> coffeehouses. We benefit from each other's knowledge and experience. We have to show them that we are awake farmers who do not say yes to everything.

I encounter with the expression of *being awake* as part of the farmer's endeavour to empower themselves against commercial advisors. The following field note is important to show such endeavour. After interviewing with two farmers in a village coffeehouse, we had a photo taken. In the photo, my eyes were closed. One of the farmers looked at the photo and remarked: "Don't sleep, be awake like us. Look, our eyes are always open, we question everything at every moment. If we are not like this, we cannot make money from agriculture. Our eyes are wide open comparing crop prices, poison prices, fertilizer prices."

Photograph 7-11: The photo of “Don't sleep, be awake like us”

On the other hand, Doğan (53, Lowland, Doğantepe) remarked the following about this state of being awake:

> Most of the time the farmer acts according to his own experience and the information given by other farmers. In the village, those sitting in the coffeehouse, keep an eye out, they watch each other to see who is doing what, if someone passes by with a tractor, and where they are going. If someone passes in front of the coffeehouse with the spray engine attached to the tractor, all the farmers run to their tractors and attach the spray engine. You can't hold anyone back. Because when a farmer sprays, it means that the pests in his field will spread to the neighboring fields. That day, a man from the village passed by the coffeehouse with his tractor with the spray engine on the back. People rushed to the gardens. Then they found out that his engine was empty, he didn't take it out, so it stayed behind the tractor. They went back to the coffeehouses.

In these coffeehouses, male farmers discuss about who uses which pesticide, which crop to plant, which seed to use. In these spaces, information meetings of companies are held and new products are introduced. Company representatives introduce new products, gather farmers to share information and organize question and answer sessions. Improved varieties are promoted, gifts such as pens and hats are given, brochures about new agrochemicals left on tables and advertisements of the companies are hung on the walls next to the coffeehouse. Cards of company representatives and brochures of the product are distributed on the tables so that farmers who do not attend the meeting can encounter this information when they come to the coffeehouse. For example, in one of the village coffeehouses I visited, the opposite walls of the coffeeshop were also covered with posters of newly released tomato seeds.

Photograph 7-12/7-13: Posters of newly developed tomato seeds hanging on the wall opposite the village coffeehouse

A day when I spent time in coffeehouses, a farmer came to ask if there is anyone who is thinking of using Peker seed or has used it before. All the farmers in the coffee shop gave their opinions, tea was drunk. One of them said “we should call Okan abi”. They called him and got related information. I learnt that he was one of leader farmers in the region and that farmers accept him as a teacher and try to take the advantage of his experiences. After the phone call and negotiations, decisions towards tomato seed seems like almost matured. I also observe that when leader farmer who is a large-scale farmer, known with his success in agricultural production comes to the coffeehouse, interactions increase. Farmers who are playing games stop and one of them orders tea for the leader farmer. His observations about the season, his comments on agricultural production, the brands of inputs he uses and his prescription are valid for other farmers. Small and medium-scale farmers listen to the suggestions of the leader and try to take the advantage from his knowledge and experience. The following words of Abidin (61, Lowland, Bayat) help to understand this interaction:

> When the leader farmers come to the coffeehouse, their word is very valid. He is asked, sometimes the prescriptions are shown to him to see if the poisoner wrote too much. A decision is made accordingly. When there is a dispute between the farmers in the coffeehouse about the prescription or the products, sometimes the leading farmers are called by phone. They are sort of like referees.

The following words of Ali (53, Lowland, Safibey), who is considered one of the leading farmers in the region, provide a close look at the issue:

> We work not only for ourselves but for all the farmers in our village. If I make good money from a new product I try, I say, Ahmet Mehmet, look, this product is doing well in the market, buy this seed, use this pesticide. In the end, if the region develops, we will all be happy. I like to try new products, and I share everything I know as much as I can when I go to coffeehouses or when they call me.

Burak (51, Lowland, Bayat), one of the lead farmers, remarked the following about his interaction with other farmers:

> There are farmers here who would throw water if they were given as pesticide What a pity. Our job is to take care of them. Farmers need to look out for each other against the poisoners, otherwise they will keep buying the latest model cars and we will keep arguing among ourselves.

Seeking for alternative information and communication networks

While male farmers exchange knowledge and experience among themselves regardless of their scale of production, I observe that medium-scale farmers develop particular a tactic, seeking for engaging in different information networks. They search for alternative information networks in order either to protect their position, to move up the social class or to prevent moving down. In addition to conversations in coffeehouses, they receive consultancy services from different dealers and companies, compare information, question prescriptions through alternative information networks, and try to make the most economically profitable decision. Medium-scale producers, who are not directly tied to dealers's apron strings like small-scale producers, but who do not receive information at their feet like large-scale farmers strive like an entrepreneur to reach the right information for them. They follow tactics such as asking questions to agricultural engineers they encounter in the ordinary flow of daily life, comparing the recommendations of dealers in Geyve province, contacting other actors outside of Geyve in line with their purchasing power, receiving the recommendations of other farmers, and participating in online information and communication networks. While comparing prescriptions farmers they follow the tactic of "pretending to obey" which is considered as a "everyday resistance" Scott's (1985) concept of "everyday resistance" refers to the subtle forms of resistance that individuals engage in in their everyday lives. In his book "Weapons of the Weak: Everyday Forms of Peasant Resistance", he argues that instead of organized forms of protest against authority, peasants practice subtle ways of resistance through ordinary behaviours such as "foot-dragging", "pretending to obey", "slowdowns". He explains that groups that are too dispersed to establish organized resistance protect and establish their sense of dignity, autonomy and control through these everyday, seemingly ordinary resistances against domination. Instead of large-scale protests and movements, he states that the oppressed undermine the power dynamics with daily resistances. When farmers receive recommendations from various dealers, firms, and producers, they appear to listen, “pretend to obey to be following the prescriptions” and pretend to accept the advice. However, they ultimately make their own decisions by comparing these recommendations and applying the appropriate agrochemicals based on their own opinion. This might be interpreted as a form of everyday struggle to the process of medicalization and commercialization, which helps maintain the farmer's autonomy in decision-making to some degree.

As discussed above, due to the fact that men dominate the public sphere as a result of the gender-based division of labour enables them to encounter male agricultural engineers in mosques, cafes, village coffeehouses and public toilets. In this way, they can talk about the problems in the field and ask other consultants about the prescriptions, suggestions given to them. The following words of Mehmet (35, Lowland, Safibey) illustrated farmers' search for alternative knowledge networks: "I go to mosque in the center next to dealers, after praying, I ask my questions to the dealers. If I see him on the road, I stop him. I stopped his car once." Abidin (61, Lowland, Bayat) supported Mehmet with the following words: "On the road, in the mosque, in the café. Even if we meet in the public toilet, I ask my questions."

Farmers in search of alternative sources of information, the majority of whom are medium- scale producers, sometimes go beyond the local and contact experts in different geographies. For example, Burak (51, Lowland, Bayat) communicated with the officer in charge of meteorological reporting at Directorate General of Airways of Bursa and tried to determine the time of spraying by asking him about the course of the climate. He expressed this situation as follows:

> The officer there helps me whenever I call. I plan my production according to the climate in Bursa. The advice I receive from pesticide dealers is set aside, and I apply it after I am sure of the climate. If experts are certain about their prescriptions, I tell them not to be sure, that other sources of information available to me say different things. They know that I am a farmer who does not agree with everything they say.

In addition, farmers receive card visits from experts they meet at the agricultural fairs they attend and try to make decisions by getting information about other regions through phone calls. For example, Polat (35, Lowland, Bayat) talked about his search for alternative information networks beyond Geyve as follows:

> I try to meet the companies that sell products to poisoners at fairs, I take the card visits of the consultants. When I have a question, I don't only trust the poisoner here. I call them and take notes of what the company representatives say. Poisoners will think of their own interests, after all, so will we. If you affirm everything they say, you become their slave.

Moreover, this search for information is also carried out through online communication tools. The primary online communication tool for shaping male farmers' agricultural knowledge formation is WhatsApp, while the social media platform is Facebook. Farmers follow the WhatsApp status of traders, dealers and other farmers and shape their production planning with this information. Bekir (51,Lowland,Umurbey) explained this situation as follows:

> I go to the market by myself frequently[39], I get the phones of the traders there. They put the products on the WhatsApp status. For example, when I see that the watermelons in Adana were not very good this year, I remarked I should focus on watermelons. I also follow other farmers Whatsapp status, I think it is very useful when making decisions.

Nihat (35, Lowland, Bayat) stated that he uses WhatsApp statuses to keep track of what other farmers are doing:

> If a farmer in Bayat put a picture on WhatsApp status showing he is spraying, Umurbey should do it the next day. Pests come a day later here. Moreover, in the harvest day, farmers put the pictures of the products on WhatsApp status, we talk about market price, price fluctuations.

Bekir (54, Lowland, Umurbey) mentioned that he uses Facebook actively and found reminders of the previous year are very useful and added following words: "It is very good to see what I did last year on Facebook, we compare how the season went. Last year the pruning was at this time, this year it was delayed. It is good for understanding the course of the climate." Mümtaz (52, Lowland, Bayat) stated that he participated in groups on Facebook and that he initially followed the group of grape producers, but then he did not find it useful:

> I was following it at first. My business is grapes and quince. Like what the grape growers in Izmir did and what they did for that disease. Then I realized that the advice there does not match here. People are already talking about other issues in the comments. Nevertheless, I have a look at there from time to time just to provide ideas.

Doğan (53, Lowland, Doğantepe) also stated that he benefited from Facebook's reminder messages and that these messages were very useful in comparing the previous year with this year: "Last year I wrote that spraying had started and I took a photo of the spraying. This year it hasn't started yet, but I will go and ask for that

[39] "Hale sıklıkla tek başıma giderim."

pesticide, I tried it once and I will adjust it accordingly.” Below are photographs taken from Dogan's Facebook page. In the one on the left, he talks about a pesticide called "bordo slurry" that he applied to the trees, while in the one on the right, he explains that he is ploughing the soil with the message "" keep struggling ".

Photograph 7-14: Examples of Facebook reminders that farmers found useful

Although an alternative mode of production and a regime of truth is not created to transform intensive agriculture, which is the dominant mode of production in the Geyve lowland, farmers generate their tactics or everyday resistance against the power of appropriationism. As can be seen in the genealogical analysis carried out in order to reveal Turkey's historical experience, the farmer tactics of the periods when public extension was widespread appear in different forms today. During the period when public extension was active, agricultural engineers and extension workers visited farmers, and information and training activities were frequently carried out in villages to improve production techniques. Agricultural counselling supply is driven by the planning of the state. At this point, farmers, who measure the knowledge of the engineer who comes to train them with seemingly ordinary activities, thus protecting their agency against the authority of scientific knowledge, develop a De Certeauian resistance. With the "ask what is known" "misleading" tactic, the agricultural knowledge and skills of the engineer are measured and a kind of reliability thresholds are established. According to the answer given by the engineer, his/her suggestions are taken into consideration and integrated into the production process. However, with the commercialization of consultancies, the farmers have been repositioned as const sharing individuals. Consultancies have transformed from a supply driver to a demand driver. This situation has also changed the tactics developed by farmers against the authority of scientific knowledge. The tactic of "asking what you know" is based on experience and observation. Today, the withdrawal of the state from knowledge production and dissemination processes has dragged farmers into a knowledge market. The utilization of this knowledge market varies according to the scale of production. Large-scale farmers have access to information without developing any tactics in line with their purchasing power, while small-scale farmers have largely lost their agency in the face of the domination of appropriationism and to transcend the set of limits medical gaze imposed from top to bottom by commercial consultants. On the other hand, medium-scale farmers do not have as easy access to information as large farmers, nor do they have to be under the domination of pesticide dealers as small farmers. In the position of an entrepreneur, they attempt to find the right information for themselves and resist the power of appropriationism to a certain extent with the tactics they develop. It should be noted that today's tactics are developed not against the authority of scientific knowledge in public extension, but against the prescriptions of commercial consultancies. These tactics against medicalization, commercialization and patriarchization are characterized by "ways of interaction" and "ways of language use". "Ways of language use" can be explained in terms of De Certeau's (1988) "non-discursive symbolization" "transforming meaning", while "ways of interaction" can be considered from the perspective of everyday forms of resistance through Scott's "pretending to obey".

The power/knowledge struggles in the socialization of agricultural knowledge in the Geyve's lowland are shown in the diagram below. Power relations are indicated by squares, tactics by circles, and are associated with different types of arrows.

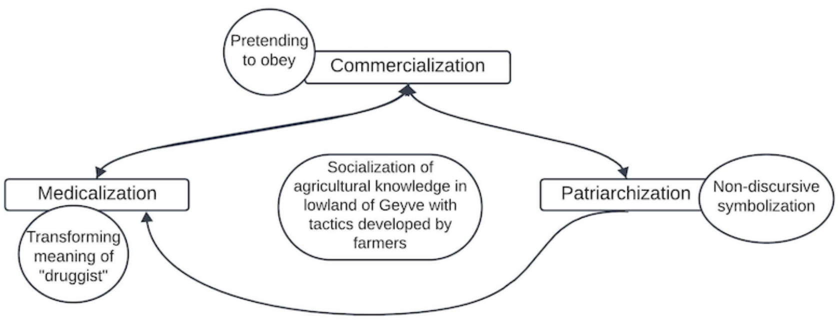

Figure 7-4: Power/knowledge struggles in the socialization of agricultural knowledge in the Geyve's lowland with tactics developed by farmers

I conclude that the form of agricultural production is intensive agriculture and its regime of truth counts medicalization, commercialization and patriarchization of agricultural knowledge as “true”. Socialization of agricultural knowledge is emerged within this triangle in terms of power relations and particular resistances and tactics among farmers and experts. Within the mechanisms that reinforce the power of input-intensive agriculture, farmers develop particular tactics to preserve their agency to a certain degree. Although these tactics do not lead an organized resistance to be emerged that transform appropriationism, they help farmers to transcend the set of limits. Foucault stated that resistance is always inherent to power. In this context, it is revealed that “pretending to obey” by farmers is inherent to the mechanism of commercialization, “transforming the meaning of druggist" isinherent to the mechanism of medicalization, and the non-discursive symbolization is inherent to the mechanism of patriarchization.

7.2. Mountain

I left earlier than usual that day, as I cross the Geyve Strait, I felt excited to be able to see it from high up in the mountains. It was quite rainy day but I could easily climb the stony roads because I had not taken off my winter tires. I knew about the roads because of the persistent warnings of both public and private advisors in the lowland that attempt to discourage my enthusiasm for the field. When I asked them to direct me to the farmers in the mountain villages, they frequently stated that this would not contribute to my thesis. They frequently repeated that “the roads are stony, tiring ", “there is nothing there", that I would get tired after traveling all that way, that I could confuse the roads. They insist that "the farmer exists in the lowland" and that they could find me farmers in the lowland if I request. These attempts actually showed me the attitude of the center towards the rural. When I asked about the information flows and communication networks between themselves and the farmers in the mountains, they remarked that farmers do not need much information since there is not much production there. When I asked them how often farmers from rural visit to the dealers, I received the answer "very rarely." I realized that the mountain/ lowland distinction is very decisive in the socialization of agricultural knowledge. This distinction was clearly evident in the following words of Recep (46, pest.dealer): "Our priority is always the lowland. The farmer is already in the lowland, there is not much up there, just peasant production. Besides, traveling from mountain to center is difficult and has a cost. If they have any questions, they call us on the phone." Lütfi (38, dist.direct.) also pointed to this distinction and remarked the following words:

> We can't reach the ones in the lowland, let alone mountain. Lowland is more important, if an unpreventable disease strikes, the agricultural economy of the region will collapse. The lowland is a rough sea, the ones in the mountains are more stable.

Mustafa (46, pest.dealer) expressed the mountain/lowland distinction in the context of agricultural information networks as follows:

> We are in constant communication with the farmers in the lowland. 7/24. Should I respond the question of farmer of lowland or mountain? Every intervention in the lowland is very critical, economic loss would very high. They need us more. Those in the mountains continue their production as a peasant.

The medicalization and commercialization of agricultural knowledge have caused both public and private sector employees to internalize the mountain/ lowland distinction, and farmers in the mountains become much more disadvantaged than those in the lowlands in accessing available information resources. During the interviews in the lowland, I realized that the mountain villages remained on the periphery in terms of the socialization of agricultural knowledge. When experts insisted that "nothing was happening" in the mountain villages, this patronizing view showed that the mountain/lowland distinction was decisive in access to knowledge.

On the days when I conduct interviews in the mountain villages, the altitude used to gradually rise, the fringing arms of the strait used to appear and I used to enjoy the view. Sometimes I need to stop my car to wait for herds of sheep, sometimes goats, sometimes a cow, sometimes two chickens and a rooster to cross the street.

Photograph 7-15: Waiting for the herd of goats to pass while climbing the mountain

The smell of fig trees would occasionally give way to the smell of manure, and then I would be greeted by the scent of roses. Although it got quite cold as I climb up, I would open the windows from time to time and feel the breath of the wind fill my lungs. As I crossed the fields, the first thing that caught my attention was that women and men were working together. Later on, I saw that this togetherness was reflected in the structure of the interviews. Due to the nature of the field, the interviews did not emerge in a gender-based manner as in the lowland. On the contrary, farm family members participated in the interviews together. Children were also included. The warmth of playing with them at the end of the meeting always heats me up more than the stove in the room.

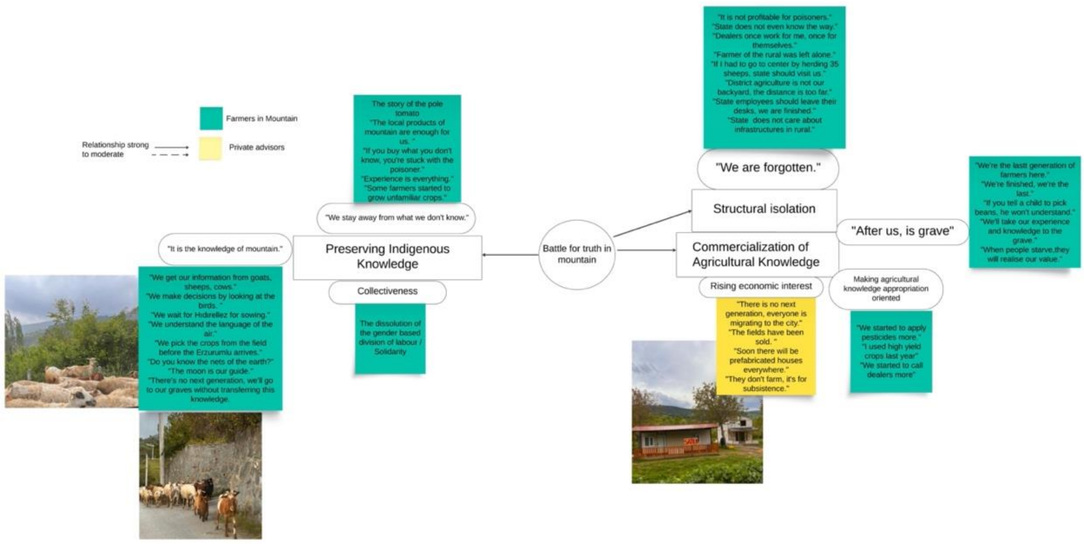

Figure 7-5: Mind map that shows patterns related to power/knowledge struggles in mountain

In the mind map above, it is possible to see the patterns of power relations in mountain, the connections between the patterns and the expressions of the actors.

7.2.1.Structural Isolation

The extent to which the agricultural production form shapes access to information has emerged through the mountain/lowland distinction, with farmers expressing that they are seen as peasants and those in the center are seen as farmers. The following words of Ferhat (60, Mountain, Akdoğan) explain how the mountain/ova distinction shapes access to agricultural information: "They are first class, we are second class. Those in the lowland are farmers, we are villagers. Everything goes to the lowland first. The state takes care of it, the poisoners take care of it. We produce for our own survival, so we are not taken into consideration much. " İsmet (40, Mountain, Çine) expressed this difference as follows:

> Below is the farmer, above is the peasant. This is how it is seen. Here, field agriculture is common, animal husbandry is common. We use less poison; we buy less fertilizer. We are less subservient to them. The poisoner goes to whoever he can get more money from. Those who work for the state don't know the way here anyway. Actually, they are the ones who should take care of us.

Rabia (50, Mountain, Halidiye) explained this situation as follows: "Farmer man-trader man, we are peasants. We are satisfied with what we eat. We try to sell the surplus. Who would you go to if you were a consultant? It would not be like the agriculturalist in the state, it is normal for everyone to think of their own interests." Havva (47, Mountain, Halidiye) agreed with Rabia as follows: "We lack of water, we have been saying this for years, but the district agriculture has not been able to overcome the infrastructure deficiencies. If we had water, we would grow more crops, we would earn some money. We eat our bread today; I don't know about tomorrow."

Mountain villages have limited arable land, limited irrigation and limited marketing opportunities. Rural farmers are largely dependent on their agricultural labour for their own subsistence. These limitations systematically exclude them from markets and commercial advisory services. Ferhat (60, Mountain, Akdoğan) described this exclusion as follows:

> Since our villages are far from the center, they are not visited frequently by poisoners or merchants. Cost of transportation is high. Those from the state never visit us anyway. For example, family doctors of the state visit here every Wednesday, but not its agriculturalists. They don't even know what we produce. Our relationship with the poisoners is also very limited. The villagers produce for their own according to their own experience.

Farmers in mountain villages associate the absence of the state in the field with "being forgotten" and express the lack of a public extension pointing out that infrastructure problems have not been solved. The dichotomies of peasant/farmer, peasant/merchant, first class/second class that emerged in the interviews are constructed through the mechanisms of medicalization and commercialization of agricultural consultancy. Through these mechanisms, the power of the center over rural is constantly reproduced and farmers in the mountains are pushed to the periphery in the process of socialization of agricultural knowledge. On the other hand, it should be noted that such mechanisms are products of historical transformations happened in agrarian structure of Turkey. In other words, the inequalities in access to agricultural knowledge in Geyve today, the disadvantages of the rural compared to the lowland, and the emerging dichotomies should be situated historically. The historical analysis in the previous section needs to be utilized to understand why the public experts that rural of Geyve expects never comes.

As Rivera and Alex (2004) point out, the weakening of the centralist role of the state in extension policies has taken place through the disintegration and reorganization of various institutions. As discussed previously, in the pre-1984 period, when public extension policies were dominant, there were institutions as one interviewee put it, "took care of the below of the soil". For example, the ToprakSu institution, which was established in 1952, was concerned with the research and development activities of the research institutes affiliated to it, the infrastructure deficiencies of agricultural lands, irrigation problems, and directed the effective use of soil and water. They conducted researches about the two most basic components of agricultural production, in a way that would provide common benefit and preserve the natural balance. This organization, which had a strong presence in the field in the 1960s and 1970s, did not differentiate farmers according to production scale; informative meetings were planned to cover all farmers in line with the public extension approach. Also, agricultural technicians were recruited to negotiate and develop scientific methods with farmers. Agricultural technicians of that periods could understand both the language of the farmer and the language of the scientific world and could make these two different languages talk to each other. The factor that enabled this to happen was public policies of the period that encouraged rural children to enroll in agricultural vocational high schools. The organization of agricultural vocational high schools was based on applied education, students coming from rural areas were introduced to scientific knowledge and modern agricultural techniques. They were able to translate scientific knowledge to the language of farmers in their own villages by demonstrating it in practice, without using a top-down language. These high schools functioned as Tisenkops et. al. (2015a) indicate are *knowledge mediators* that integrate local knowledge into institutional knowledge, farmers language into scientific language and able to support farmers to become active agents in knowledge generation. Today's "agriculturalist" in Geyve, who does not come to the rural from the center and who does not know the way to the mountain, was already composed of actors living in the rural in that period. In the context of the statement "The farmer does not believe in anything he has not seen other than God", which emerged in my interviews with agricultural engineers who have carried out public extension activities in previous chapter, it was possible for students studying in these high schools to disseminate the scientific knowledge they learned in their own villages in practice. However, by the early 2000s, this structure had been dissolved and the General Directorate of Rural Affairs and the Soil Water research institutes became dysfunctional after they were closed down in 2005. The interviewees I interviewed to make a historical analysis expressed this change by stating that research has shifted from "below ground to above" and that infrastructure strengthening activities have been replaced by paper-based subsidies. In addition, agricultural vocational high schools, which were taken from the Ministry of Agriculture and administered to the Ministry of National Education in 2004, have moved far away from the applied education curriculum. The understanding that prioritizes the education of rural children and tries to convey scientific knowledge to farmers in the language of farmers was disappeared. This restructuring in high schools also ended the function of technicians as an intermediate actor that translate the language of expert and farmer. The weakened public understanding of extension was replaced by commercial consultancies and farmers were transformed into actors who need to pay to access information. Today, the fact that the mountain villages of Geyve remain on the periphery of the socialization of agricultural knowledge is related with the 1984 reorganization Ministry which results in the obsolescence of institutions and research institutes that deal with the "below the soil", the reorganization of agricultural high schools that train intermediate staff who bring knowledge to the rural and weakening public extension and commercialization of consultancies. Moreover, as can be reviewed in the historical analysis section, it is seen that the difficult access to information for rural areas has been recognized and projects to improve this situation have been tried to be implemented from time to time. Projects such as KÖYMER (2005) and TARGEL (2007), carried out by the state with the intention of "an engineer for every village" aimed to meet the need for intermediate staff that establish close relations with the farmer and respond to his information needs. Through a centralized appointment system, agricultural engineers were appointed to the villages by ensuring that these personnel lived in the rural and be the guide for farmers. On the other hand, the majority of these engineers came from the city and their education was weak in applied courses. Eventually, they could not be adapted to the rural and two projects ended with the reappointment of those public experts to district agricultural directorates in the center. Since then, any other state project has not been developed to meet the information needs of rural areas. Furkan (35, Mountain, Akdoğan) explained the need of rural Geyve for actors to meet the information needs of farmers as follows: "We want agriculturalists who have their feet on the ground. We need agriculturalists who are rooted in the rural[40]. City experts don't understand our situation." Also, İsmet

[40] "Kökü kırsalda olan uzmanlara ihtiyacımız var."

(40, Mountain, Çine) expressed this situation in the following words: "We want dedicated agriculturalists, not appointed ones[41]. Let them come here, let's look at the soil and water together."

I understood from the preliminary interviews, in mountain the form of agricultural production is agricultural subsistence agriculture and it is relied on farm family labour. Crops or livestock raised are used to maintain farm families, meet the needs of themselves. Farm families use limited amount of agrochemicals and unimproved varieties of crops and livestock. Although agricultural production is based on self-sufficiency, farm families also participate in trade to some degree due to seasonal surplus they gain. On the other hand, the low yield and marketable surpluses of subsistence production also reduce the purchasing power of information. Today, when agricultural advisory services are commercialized and public extension is weakened, farmers in mountain villages are in a disadvantaged position in terms of accessing advisors and information resources. On the other hand, the knowledge of commercial consultancies is appropriationism oriented. Prescriptions correspond limitedly to the information need of farmers in mountain. I observe that the need for such information is increasing for farmers who want to increase their surplus and engage in market relations. Yet, due to the limited extent of capitalist penetration, indigenous knowledge is able to be reserved and still used during decision making.

7.2.2. Preserving indigenous knowledge: “This is the knowledge of the mountain."

In the mountain, agriculture is not separated from animal husbandry in the mountains. Field cultivation is common as well as gardening. Indigenous knowledges in the mountains are influential in the decision-making processes of farm families. Agroecological knowledge guided by the natural calendar remains functional. The intertwining of animal husbandry with agriculture in the region leads farmers to follow the natural calendar, preserve the local ecology knowledge passed down from generation to generation and make decisions based on it. I observe in mountain of Geyve, subsistence farming is a common form of agricultural production and has constructed its regime of truths and using indigenous knowledge counts as “true”. It offers transcending the triangle of medicalization, commercialization and

[41] “Atanmış değil, adanmış uzmanlar istiyoruz.”

patriarchization that reinforce the power of intensive agriculture I observed that socialization of indigenous knowledge creates a separate regime of truth that is epistemologically different from that of the lowland. The following statements of Hatice (60, Mountain, Akdoğan) clearly show the impact of the indigenous knowledge of the farmer on decision-making processes: "We get information from the goats we feed. When the animal stretches its front leg, we know that summer is coming, the weather will get warmer. According to the behavior of the animals, we decide when to spread their manure on the soil."

Ferhat (60, Mountain, Akdoğan) emphasized the importance of certain dates for agricultural production as follows:

> This May 10th is the knowledge of our mountain. I mean Hıdırellez. Until that time comes, we are afraid of the climate and the soil, we don't touch it. After that time, planting starts. In the lowland, they don't wait for Hıdırellez anymore, they plow the soil earlier, they throw more poison. But this date is important, if you work the soil before then, it will hurt and you will not be happy.

İbrahim (57, Mountain, Çine) stated that decisions are made collectively in rural areas and that past experience is the most important element in making these decisions. Regarding the sources of information they use, he remarked the following:

> We look at the movements of animals when we make decisions. For example, when birds fly en masse, we know that the cold will start in a few days and we take precautions accordingly. Not many people in the lowland know this information, they cannot predict weather events in advance, they say somethinghappens, what do we do after it happens. Since we live in touch with nature, we act accordingly. Instead of poison, we make Gülleci slurry[42], a mixture we learned from our ancestors. Everyone knows this in the mountain villages. It is enough.

Havva (47, Mountain, Halidiye) gave an example of indigenous knowledge:

> When the soil is ready for planting, it is covered with webs, like a spider web. The furrows are covered with these webs. We follow these webs a little early and a little late depending on the season. When we see them, we realize that the soil is ready. The change of seasons affects not only us but all living things, and when we make decisions by looking at them, our margin of error decreases.

Ferhat (60, Mountain, Akdoğan) added another example as follows:

> 27th of November. The Erzurumlu[43] will come. It means the frost falls. It gets cold. Until then, you must take what you can from the land. You shouldn't leave peppers in the field. Everything you leave will be taken away by Erzurumlu. We say 'Erzurumlu took it'.

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[42] Gülleci bulamacı

[43] “27 Kasım’da buraya düşer, buna Erzurumlu geldi deriz.”

Farmers who use indigenous knowledge as independent sources of information in their decision-making processes also create a discursive space of resistance similar to the one in the lowland by assigning the persona of "poisoner" to pesticide dealers. All farmers in the mountain villages, regardless of production volume and gender, used the term "poisoner" when talking about pesticide dealers. Farmers in the mountains, who produce with ecological relations taken into consideration, realizes that the agrochemicals they use harm the ecology and make them dependent on commercial consultants. Reha (35, Mountain, Halidiye) expressed this situation as follows:

> I hear from the farmers in the lowland, things like pesticides and doctors. They basically make throw poison. To kill one pest, it kills the whole field. We use as little as possible here. It's not a good thing. No one calls them pesticides here. How could they?

The capitalist mode of production penetrated the mountain villages to a limited extent due to the small size of the land, low productivity due to lack of infrastructure, the distance of the villages from the commercial center, and the extra cost of transporting the products. In mountain agriculture, where capitalist penetration and appropriationism had a limited impact, the preservation of indigenous knowledge could be realized, creating a form of epistemological resistance to the dominant truth regime of the lowland. On the other hand, although capitalist penetration is limited in the mountain, I observed appropriationism-oriented knowledge started to socialized.

7.2.3. Commercialization of Agricultural Knowledge

In the mountain, production is based on subsistence and to some degree is for marketing. The limited penetration of capitalist mode of production in mountain also limits impact of appropriationism, medical gaze of prescriptions and ensure the preservation of local knowledge. As long as local knowledge continued to be a shaping factor in decision-making, it also limits capitalist penetration. This creates a form of resistance that does not exist in the lowland. Farmers in the mountains are able to step out of the boundaries of appropriationism and related information and communication networks, and create an alternative regime of truth within a moment of refusal. On the other hand, I observed that the need of appropriationism-oriented knowledge is increasing among farmers. I realized that the power of commercial consultancies over farmers was increasing. In this way, it is possible to say that a Foucauldian battle for truth is taking place in mountain villages. The truths of appropriationism and truths of indigenous knowledge, their relation to the exercise of power/knowledge collide. In the mind map below, it is possible to see the patterns of battle for truth in mountain, the connections between the patterns and the expressions of the actors.

Firstly, since gender-based division of labour is not significant in agricultural production, the collaboration of between appropriationism and patriarchy has been largely deconstructed in the mountain. Before applying agrochemicals, one requires to go "down" to the center. Since women do not know how to drive a car and agricultural engineers at dealers are men, the purchase of pesticides is constructed as a male task in the mountains as it is in the lowlands. However, since gender roles are not sharply divided in agricultural production, appropriationism is not treated as a piece of information passed only between men. Following words of Ayşe (56, Mountain, Çine) indicated it: “Males understand prescriptions as well as we do. We decide together what to do with the poisons they take. We avoid using it unless it's necessary. It damages both our pocket and soil.” Although men are responsible for purchasing inputs, prescriptions do not turn into rational items that are dominated only by men, whose knowledge can only be possessed by men. In other words, the close collaboration of patriarchy with appropriationism in the lowland is weakened considerably in the mountain through the collective labour of the farming family.

It has been revealed that due to certain discontinuities in the lowland, appropriation-orientated knowledge turns into fragments of information, cannot accumulate, and almost cannot be experienced. The farmers in the mountains stand against these discontinuities, against the fragmentation of knowledge into information. Farmers stated that the knowledge of the mountain makes them "independent" and that they avoid being dependent on commercial consultancies, which is possible by not turning to high-yielding varieties and agricultural inputs that would increase productivity. The following words of Ferhat (60, Mountain, Akdoğan) show this conscious restriction:

> There were no pole tomatoes here before. They came here to sell them. Then it turned out that poison had to be bought for this tomato. This poison, that poison, they cost a lot of money. After a while, they stopped coming to the village. I remember once I had to go down to the plain behind 50 sheep. What kind of agriculturalist talks from behind a table? He's talking to me; ‘you'll throw this, you'll throw that’. As we don't know what a pole tomato is; he is able to write a lot of poison. Without coming, without seeing the fields. We were novices of tomato. After that season, we gave up pole tomatoes. The products we have mastered are enough for us.

Rabia (50, Mountain, Halidiye) expressed her opinions as follows:

> We have apples; they are the children of the mountain. You cannot imagine of their taste. They have been here since our childhood. It is remarked that it would be more profitable if we cut apple and planted walnuts. No, we do not touch those threes. They were here before us. We do not walnuts, we know apples.

İsmet (40, Mountain, Çine) agreed with Rabia with the following words:

> The farmer trusts himself the most. Experience in agriculture is everything. If you know that apple, you know its temperament, you know what to do when it gets sick. If you try a new product, this time you have to do whatever the poisoner says. In other words, you become dependent to him.

On the other hand, it was revealed in the interviews that this resistance based on to stabilizing the product pattern and not to be dependent on prescriptions has started to break down to some degree. I observed that the "truths" of appropriationism has been gaining space in the battle for truth by the increase in the economic concerns of farmers. Furkan (35, Mountain, Akdoğan) regarded the strengthening of appropriationism as a state's failure to make a production plan. He mentioned that farmers are now "in search of other things" and added:

> The apples here were very good. They were sold when they were on the branches. Then there was an overproduction of apples in Kayseri and prices dropped to the bottom. No one came to the mountain to buy those apples. If we hired workers from the center, it would exceed the income of apples. The trees of our childhood, we can't bear to cut them down. But it looks like we will have to cut them down, we will try products that make more money instead. We are now in search of other things, I mean, seedling growers, poisoners, this business is organized with them.

Similarly, Hacer (35, Mountain, Halidiye) explained that appropriationism-driven knowledge has started to become widespread in mountain villages with the following words:

> We have more fertile soil than those in the lowland. Recently my husband bought some poison, we decided to throw some, it did a lot of good for the sunflowers, we made good money. Our crop was not ruined. The next neighbour didn't want to throw it, it was a pity. In that case, you have to sell it and go to the city, there is no other way.

İbrahim (57, Mountain, Çine) had the following to say about the "costs" of the spread of appropriationism in mountain villages:

> There was a walnut deficit in Turkey, it was a much talked about issue among farmers for a while. At that time, some families cut down their apple trees and planted walnut trees instead, and some planted almond trees. These trees could not adapt to this region. Since farmers did not know the trees very well, they could not understand the language. They ask questions to district agriculture a fewtimes but you know it is not our backyard, it is far away, farmers can't go there every day. In the end, walnuts were burned in the first frost; they could not complete their development. It's a pity.

"After us, is grave"

Truths of appropriationism are strengthened due to the fact that next generation moves away from agriculture. Participants stated that that there is no generation to inherit what they know, that youth migrate to the center due to rural poverty and not interested in agriculture. Migration from rural to urban areas is an important factor that interrupts the socialization of indigenous knowledge, undermines its sustainability and indirectly reinforces the authority of appropriationism in the battle for truth. Hacer (35, Mountain, Halidiye) stated that poverty in rural areas is getting deeper as the state forgets them and that young people are migrating from agriculture for this reason:

> We are the last generation doing agriculture. Our children are not interested in agriculture. They are not interested in animal husbandry. Why should they be interested? They see our situation. The state should hear our voice as soon as possible to solve the water problem in the villages. How will young people turn to agriculture? For this, state needs to be taken care of us, first. Children who are born in agriculture and can digest ancestral knowledge grow up without any agricultural knowledge. The week ago, I asked my daughter to pick the beans. She picked them up to the root. These children do not know agriculture.

Ferhat (60, Mountain, Akdoğan) stated that the knowledge they had could not be passed on to the next generation, that ancestral knowledge would go with them to the grave and added:

> I would like to tell my grandchildren, look, the goat did this, the birds flew like this. They don’t care. If you say Erzurumlu, they would ask who he is. Youth have nothing to do with agriculture. We will go to the grave with this knowledge. I don't know what will happen afterwards.

Zeynep (37, Mountain, Akdoğan) had the following to indicate the presence of the state in the field needs to be recognized so that young people do not move away from agriculture:

> The state wants us to be prisoners of poisoners. The poisoner once works for me and once for himself. It is commercial. Agriculturalist of the district office, why don’t they come to visit us, at least once a year? There are promises of rural development on TV, how will rural develop? There is no guarantee to buy the products, the infrastructure is poor, the young generation is moving away. The state agriculturalists have forgotten the roads to mountain. You cannot understand the rural areas by looking from the city. In order to develop the rural, you have to go to there first, right? We are the last generation, there is no one coming after us. After us, is grave.

Ayşe (56, Mountain, Çine) also shared same opinions with Zeynep as follows:

> We have no ambition to produce more. We are fed today, thank God. But let me tell you that there is nothing after us. The farmers here are finished. The population is old, young people are not interested. Children who grew up in agriculture don't look back for agriculture. If they do, they don't know anything. In the future, they may ask how to farm, when they visit our graves.

In my interviews with commercial consultants, they indicated “truths” of appropriationism will ultimately win that battle for truth. They mentioned that with indigenous knowledge farmers can produce enough to support themselves but for earning money, they need to use agrochemicals, if they do not choose it, they will be pushed to sell their land. Advisors emphasized that the lands of the mountain attract the attention of urban dwellers because of their scenery, so they can be sold at high prices. For example, Recep (46, pest.dealer) expressed his opinions as follows: "Either they will adapt to the system or they will end. After three to five years, prefabricated houses will cover all the mountains. The population is old, young people are fleeing. No one will be left there in a few years."

Also, Haşim (45, company.rep.) agreed with Recep with the following words: "Subsistence agriculture is practiced in the mountains. After a short time, everyone there will either farm in a way that will increase their profit margin or sell the land and leave the villages. The population is old, young people want to stay in the city. There is no way out." The photo below shows the prefabricated houses built on the sold land that Haşim mentioned. The one on the left is labelled "for sale".

Photograph 7-16: The prefabricated houses mentioned by Haşim in Akdoğan, one of the highest-altitude mountain villages

The diagram below shows the power/knowledge struggles that emerged in the socialization of knowledge in rural Geyve. Power relations are indicated by squares, resistances by circles, and are associated with different types of arrows.

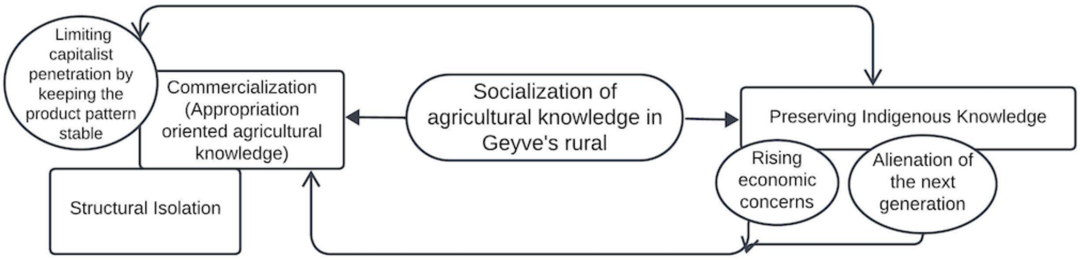


Figure 7-6: Power/knowledge struggles in the socialization of agricultural knowledge in the Geyve's mountain

To summarize, the socialization of agricultural knowledge in mountain villages emerges within a Foucauldian battle for truth. Truths of preserving indigenous knowledge and making agricultural knowledge appropriation oriented collides. Due to limited penetration of capitalism, indigenous knowledge is able to be preserved and entails an epistemological resistance to intensive agriculture. In this context, the triangle of triangle of medicalization, commercialization and patriarchization of agricultural knowledge is deconstructed to a large extent. The existing farming population deliberately limits capitalist penetration, fixing production patterns and limiting the use of agrochemicals and thus the need for appropriative knowledge. This strengthens the preservation of indigenous knowledge. On the other hand, although farm families continue to protect indigenous knowledge and to remain independent from commercial consultancies, interruptions and discontinuities in the socialization of indigenous knowledge are emerged through the mechanisms of “structural isolation” and “commercialization of agricultural knowledge” which lead it to be subjected to a kind of epistemicide. Appropriationism is strengthened by the economic concerns of the farmers and the next generation's move away from agriculture. Farmers of the mountain stated that the state had "forgotten" the rural, and that it had become very difficult to make money from agricultural production due to growing infrastructure problems, and that they had no choice but to apply poison and try improved crops. They stated that the deepening poverty in rural areas has encouraged young people to migrate to the city and that there is no next generation to leave the inheritage of ancestral knowledge. Children who grew up in agriculture are running away from it by being even "incapable of recognizing beans". Participants also stressed that farming population is ageing and they are "going to the grave" with them with the experience and knowledge they have accumulated. They also mentioned that they need knowledge mediators, actors to combine rural knowledge with expert knowledge. These three factors reinforce the appropriation of agricultural knowledge in rural.

As discussed in the previous sections, domination mechanisms that reinforce the practices of intensive agriculture diminish the environmental concerns. In this context, sustainability is defined to enable farmers to sustain their own livelihoods (Labarthe and Laurent, 2013). On the other hand, with the deepening of the climate crisis, agricultural production is becoming more difficult and sustainability debates are on the rise. Excessive pollution of natural resources, decrease in arable lands, increase in unpredictable weather events due to climate change make it difficult to continue agricultural production. The use of digital agricultural technologies and big data-driven information in agriculture is encouraged worldwide. In various declarations, agreements and vision studies, it is envisaged that digital climate stations will warn farmers against unpredictable climate events with the decision support systems they provide, and that big data-driven information will guide farmers to the right practices at the right time, thus reducing the amount of inputs used and making agricultural production more sustainable. The extension of digital climate stations stands out as one of the main pillars of this incentive. These stations provide farmers with real-time data on the climate, give extra local weather forecasts, and help them to apply the right amount of agrochemicals at the right time. While agricultural companies can purchase stations for their own land, public organizations and NGOs process the information and send it to farming communities in the form of early warning messages. As mentioned in the previous sections, the Ministry of Agriculture and Forestry has initiated a digital transformation drive to transition Turkey's agricultural production centers to sustainable agriculture. The most important and most widespread pillar of this transformation in Turkey is the establishment of digital climate stations in line with the grants provided. With these stations, it is aimed to provide farmers with access to data-driven information, to make decisions at the right time by using the right information, thus minimizing the amount of agrochemicals used and reducing the damage to the ecology. Geyve is one of the districts benefiting from this grant. It is aimed to deliver big data-driven information to farmers in order to reduce the damage caused by input-intensive agriculture to the ecology and to make production more sustainable. Through the digital climate stations established, it is aimed to provide data-driven information to farmers and lead them to make intelligent predictions about production. Thus, it is aimed to eliminate the ecological and economic uncertainties experienced by farmers. The Ministry aims to translate the big data-driven information collected from the stations through provincial and district agricultural directorates into a language that farmers "understand" and sends early warning messages for this purpose. In this way, it is thought that efforts are made to replace the input-intensive agriculture understanding with sustainable agriculture and to spread ecological awareness among farmers. In addition to the three stations donated by the Ministry of Agriculture and Forestry, the Beet Growers Cooperative in the region has also established a digital climate station for itself with a grant from a private bank. It is expected that the climate stations, which reached four in 2023, will make agricultural information in Geyve big data-oriented, direct farmers to use agrochemicals in the right amount, reduce the damage to ecology and make it more sustainable.

In order to understand the implications big data-driven information in terms of socialization of agricultural knowledge and answer to what extent the early warning messages ensure sustainability, it was necessary to understand agricultural production forms of Geyve and mechanisms of establishment of information networks. The discussion above was conducted based on this concern. Once the skeleton of socialization of agricultural knowledge of Geyve is revealed, it can be discussed the implications of digital transformation.

7.3 Implications of digitalization on socialization of agricultural knowledge

“You mean pheromone trap?” “Don’t you mean pheromone trap?” “What’s a digital climate station?” “We’ve never seen such a station?” “What does it look like?” “For what, exactly?” “When was it established?” The first answers I received from all participants to the questions I asked about digital agriculture in Geyve were largely in this direction. Some of the interviewees confused the digital climate station with pheromone traps, while others remarked they had never seen such a station in their lives and did not know what it looked like. The word "message" worked as a key word. After a few minutes, the blockage in the conversation passed and they were giving their views on whether the early warning messages were a separate source of information. In the mind map below, it is possible to see the patterns of implications of digitalization in socialization of agricultural knowledge in Geyve, the connections between the patterns and the expressions of the actors.

Figure 7-7: Mind map that shows patterns related to implications of digitalization

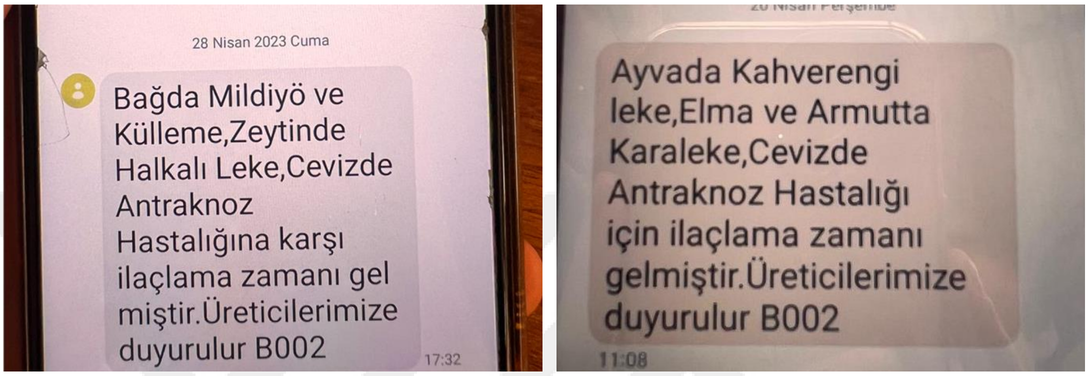
7.3.1. Lack of reliability and validity of early warning messages

The mocking facial expressions and body language of the male farmers in the lowland while commenting on the early warning messages are in themselves important for understanding how the stations are experienced by farmers. Abidin (61, Lowland, Bayat), stated that early warning messages do not contain accurate information. Also, Mümtaz (52, Lowland, Bayat) stated that these messages are not accurate and that the margin of error is very high. Likewise, Abidin and Mümtaz, Mehmet also (35, Lowland, Safibey) mentioned the concerns towards validity and reliability of the early warning messages:

> Those messages, they have nothing to do with reality. First of all, these messages come to every village at the same time. This is proof that it is unreliable. Geyve has microclimate features. The climate changes from one village to another. What that village should do is cannot be same as what the other should do. If you tell everyone to do the same thing, how will it work?

Doğan (53, Lowland, Doğantepe) expressed his skepticism about early warning messages in the following words: "Geyve is a microclimatic region. There's a difference in climate between the other side of the road and the other side. Temperature, humidity, everything changes. The message to me is the same as the message to the village above, how? It is suspicious."

Moreover, farmers also stated that messages were received for different crops at the same time. Although grapes and walnuts, quince and grapes have different phenemologies, messages were delivered collectively. Polat (35, Lowland, Bayat) showed the collective message about vineyards, olives and walnuts and remarked that these two diseases belong to different time periods, that combining the messages increases the margin of deviation and that farmers who see these deviations do not trust the messages. Below are examples of combined messages. The one on the left indicates that it is time to spray against certain diseases in grapes, olives and walnuts. The one on the right indicates that it is time to spray for certain diseases of quince, apple, pear and walnut.



Photograph 7-17/7-18: Farmers showing the combined message of different products

Participants also emphasized that early warning messages did not come on weekends, and frequently repeated that agricultural production does not recognize weekend. Cafer (65, Lowland, Umurbey) mentioned that this situation undermines the farmer's trust in the early warning system: “I don't get any messages on weekends. Does agriculture stop on weekends? Let's say it rains, the system doesn't see it. Will I wait until the message comes? No, otherwise my crop will be wasted. If a farmer waits for these messages, he will starve."

Nihat (35, Lowland, Bayat) is close to Cafer's views:

> These messages have no validity for the farmer. Will he wait for the message when he has to spray pesticides on weekends? He won't. He will not take that risk. If he does, he will starve. Let me tell you this, farmers always spray more than enough to minimize crop loss, let alone decreasing. They need to act as a guarantor. Who will take care of him, who will cover his losses? No one.

Furthermore, farmers mentioned that there are at least twenty applications per season in the lowland. Hence, they claimed that there should be at least twenty early messages but their number do not reach twenty. Ali (53, Lowland, Safibey) explained this situation as follows:

> If there is a pest in my neighboring field, he will spray, if I don't do it, that pest will come to me. According to the message, it is not time yet. How does he know about my field? The next neighbor did it, the other one did it, if you don't do it, you will be the loser.

"Double-headedness"

The loss of validity and reliability of early warning messages was also a prominent pattern in my interviews with commercial advisors. Pesticide dealers repeatedly stated that they had tried to set up their own messaging systems to address this shortcoming, but that this was prohibited by the government. Dealers expressed that "they do not create the messages based on their own information" by pointing out that Provincial Directorate of Agriculture is the institution that actually creates these messages, processes the data and translates it into an early warning format. The following words of Mustafa (46, pest.dealer) point to this prohibition:

> We receive messages from the Provincial Directorate of Agriculture. Anyone who wants to receive early warning messages goes to the District Directorate of Agriculture and registers. The District Agriculture sends the list to the Provincial Directorate of Agriculture. It is already forbidden to produce and disseminate separate information on our own. The state does not allow it.

Recep (46, pest. dealer) also points to deviations of early warning messages and the related prohibition:

> The messages sent by the Provincial Agriculture do not match the data here. Lower village and upper village differ in climate. Mass messages mislead farmers. We wanted to make our own measurements, utilize technology, disseminate our own information, and create our own message system. The state did not allow us to do so in order to avoid double-headedness. It wants us to accept that the information it sends is absolutely correct. But the deviation rate is very big. It is not local. For this region, where the microclimatic climate is dominant, it would be best to send a different message to each village. Ministry does not allow us to do it.

A commercial consultancy that purchased a climate station for its members with a grant from a private bank remarked that they initially shared early warning information based on their own data, along with messages sent by the Provincial Directorate of Agriculture. When this was noticed, the Provincial Directorate of Agriculture came and warned them, and they were warned not to publish the information they obtained by processing the data from their own stations in order to avoid double-headedness. They were reminded that this was prohibited. Kaan (39, Beetgrow.coop) expressed this situation in the following words:

> How we utilize technology is in our hands. It is also in our hands to organize it for the maximum benefit of the farmer. Unfortunately, at the moment, digital farming stations, which are known as smart, have no function because of the deviations in messages. It doesn't have to be this way.

On the other hand, Necati (44, Beetgrow.Coop) stated that he did not like the word digital agriculture and that both agriculture and technology are human dependent and remarked the following:

> What happens when you say digital agriculture? Is the soil digital, is there no living life? It is a word that does not suit agriculture, agriculture is the living life itself. When you measure the soil with digital tools, you still get the information of a living being. When we talk about digital agriculture, it is as if we have entered the space age and agriculture is carried out without human beings or living beings. This is not true, how we use agriculture and technology is in our hands. If we don't use for good those stations are just stick.

In these interviews, there are expressions similar to the transformation of the state from a protective actor to a punitive, prohibitive actor as revealed in the interviews of farmers indicating that public experts on the ground to issue fines. I observe that the way digital farming stations are organized and used reinforces the perception of the state as a punitive actor. In the case of digital agricultural stations, pesticide dealers explained the inability to produce and disseminate their local message system with the state being a prohibitive institution, and stated that the conditions of the region should be taken into account in order to use technology for the benefit of farmers.

“If you make plan based on those messages, you will starve”

In the interviews, it was found that early warning messages that represent digital agriculture do not function as planned in theory and create their own contradictions. These contradictions are emerged either in new forms or reproducing the existing inequalities of intensive agriculture which are actually trying to be reduced. It has been revealed that digital agricultural stations, which are expected to increase sustainability, and reduce spraying resulted in an opposite effect. Bekir (54, Lowland, Umurbey) expressed this specific contradiction in the following words:

> There were serious losses among our friends who decided to spray based solely on the incoming messages. You know it is necessary to prevent the pest in advance, once it starts to reproduce, it is very difficult to prevent it and requires spraying a lot. These messages did this. They mislead farmers and eventually lead them spray more.

Cafer (65, Lowland, Doğantepe) also agreed with Bekir with the following words:

> It has nothing to do with reducing pesticide use. On the contrary, these messages increased the use ofpesticides. Since they did not provide accurate information, they led the farmers to make mistakes, it became difficult to fight the diseases. Farmers run to dealers. This time, more pesticides were used than usual.

Burak (51, Lowland, Bayat) described this contradiction in the following words:

> Those who sprayed in line with early warning messages could not prevent diseases and pests. When the disease increased, they go the dealer again, this time they had to apply much more pesticide by suffering from crop losses. In other words, the messages in the region increased the use of pesticides. Those who have experienced it, do not pay attention to messages anymore.

It is thought that the extra local climate information obtained by processing big data obtained by precise measurements through digital sensors enable farmers to make the right decision at the right time. On the other hand, it is understood that the early warning messages which are supposed to provide predictability, has lost its validity and reliability due to reasons such as the lack of stations, the placement of the stations is not organized according to microclimatic effects, and even causes farmers to spray

"Messages come from dealers."

I also realized that farmers are as skeptical about the content of early warning messages as they are about the sending channels. Some of them think that these messages are the result of observations by commercial consultancies and that they are sent by dealers. Farmers point to the early warning messages received during the interview and say, "There are no messages from district agriculture." "Dealers send the messages." "No one sends messages except the dealers." They point to the sender part by using expressions such as "No one sends messages except the dealers.” For farmers, early warning messages are not providing information that will strengthen their decisions and enable them to make the right decision at the right time, but a kind "time to go to the dealer" reminder. Nihat (35, Lowland, Bayat) describes this situation as follows: "The messages we receive tell us that it is time for some spraying, I understand that I need to go to the dealer. I visit and ask my spraying schedule or sometimes when I received the message, I have already sprayed." Ali (53, Lowland, Safibey) shares the same ideas as Nihat: "Everyone already has a spraying schedule here. The dealers set that schedule for us seasonally. We spray at least twenty times a season here. These messages don't matter much, everyone sticks to their schedule."

Mehmet (48, pest.dealer) explained how early warning messages, which are operated actually as a part state’s public extension service, "turn into a message from the dealer" as follows:

> Actually, this is a kind of contradiction. It is the state that produces, processes the data, and it is the state that disseminates it. But since farmers are not registered in the

> system, we go to the District Agriculture and register our numbers to the system. The number of farmers who go and register on their own is very very small. Since we are registered, when messages come to us, we send these messages to our own customers. This is actually the work of the District Agriculture and Provincial Agriculture. But no one from there goes to the farmer's foot and registers their number. They expect farmers to go their foot. We know that this is the case, we stepped in as an intermediary. In other words, we don't actually produce any information, we send the farmer the message that he should have already received.

In order to receive early warning messages from digital agricultural stations, farmers have to go to District and Provincial Directorates of Agriculture and are expected to register to the system upon their own request. The extension approach that defines the farmer as an entrepreneurial actor who should pursue knowledge (Leewis, 2006) and transformed advisory from supply driven to demand driven (Stock and Forney, 2016) has reproduced the same definition in terms of access to data-driven information. On the other hand, for many of the reasons discussed in the previous sections, the relationship of farmer with government is weakened and the necessary interaction is established by commercial advisors. Because of this weak link, farmers are unable to register with state institutions and commercial advisors fill the gap just like intensive farming. This shows that digital farming stations failed to the meet expectations which are supposed to strengthen the farmer's autonomy, enabling the farmer to make the right decisions at the right time, guiding the farmer to use less agrochemicals.

The fact that pesticide dealers are the actors that accelerate the dissemination of early warning messages has led to the reorganization of this information in the economic interests of the dealers. Mehmet (48, pest.dealer) describes this situation as follows:

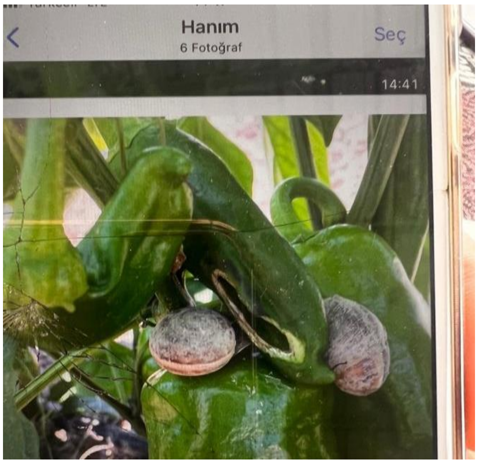
> We do not send warning messages from Provincial Agriculture one by one. We keep them for a few days and send them collectively, and there is a cost for sending messages. We have to think about the cost. It is normal for us to prioritize the customers in the plain, if a disease spreads there, the agricultural economy will be over. Anyway, no one plans production according to these messages, this is just for informational purposes. It is kind of reminder that time for spraying is approaching, farmers need to come and get their pesticides.

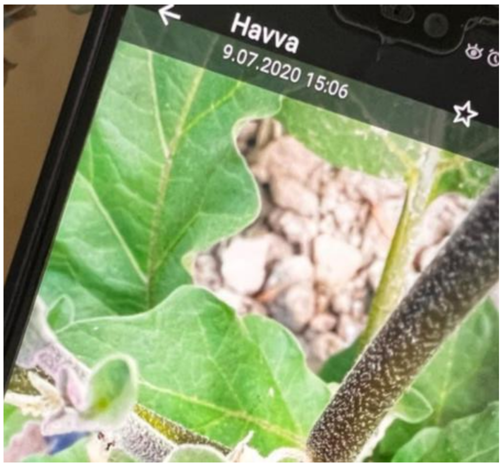
Recep (46, pest.dealer) remarked the following about the delivery of big data-driven information to farmers: "It is impossible to send every message from Provincial Agriculture directly to the farmer. We combine the warnings that come close to each other and send them. This minimizes the cost of sending messages." Mustafa (46, pest.dealer) stated that they provide messages just to inform farmers and added: "If the messages for grapes and quince are close to each other, we combine them and send them. Sending message has a cost.”

7.3.2.Reproduction of gender distinction

During the interviews, I realized that as appropriationism-oriented knowledge circulates between male farmers and male agricultural engineers, turning into a kind of masculinity practice, early warning messages are also transmitted in networks of men. Women farmers in the lowland are positioned outside the socialization of big data-driven knowledge. While most of them do not know their own phone numbers, they say that poisoners call their husbands. Nazlı's (50, Lowland, Bayat) words, "If someone's phone number is to be given, my husband gives it to them, he talks to the poisoners, I don't know them, I don't talk to them, it's not my job." clearly illustrate this division of labor. Similarly, İlknur (40, Lowland, Safibey) stated that she was not interested in the messages sent by the poisoners, that she did not even know her own phone number and added the following words: "My husband knows the dealers. They have my husband's phone number. The messages come to him. There is no need for my number.” Sare (60, Lowland, Bayat) stated that she was happy that she did not receive an early warning message with the following words: "I swear I have a lot of work. Field, house, kitchen...I cannot deal with the messages. It comes to my husband; he takes care of it.”

Moreover, it has been revealed that big data-driven early warning messages are not decisive in the decision-making processes of male farmers. The “actual” warning messages sent to them by their wives working in the field. Due to gender-based division of labor, women who work in the field as laborers have the opportunity to observe the crops while planting seeds, hoeing, and taking care of the plants. They send messages to their husbands on WhatsApp when for example peppers are infested with worms, grape leaves turn yellow, and quinces turn ashy.





Photograph 7-19/7-20: Examples of warning messages on male farmers' mobile phones from their wives

Polat (35, Lowland, Bayat) mentioned that messages of his wife play a more effective role in farmers' decision-making processes than digital agricultural stations: "My wife is like my assistant. I need her observations to make the right decisions. She warns me by sending me photos of the crops, my early warning messages come from my wife and they come before the dealer send." Nihat's (35, Lowland, Bayat) following remarks are similar to Polat’s: "I don't pay attention to the messages of the dealers, the messages sent by my wife are early warning messages for me. If she does not work in the field, I cannot take the right decisions.” Also, Ali (53, Lowland, Safibey) has similar remarks: "I receive the information from my wife. She sends videos, calls on WhatsApp, sends photos. My wife is my eyes in the field."

The installation of digital farming stations and the delivery of big data-driven information to farmers has practically reproduced the gender-based division of labor of intensive agriculture. The "actual" warning messages that male farmers take into account in their decision-making processes come from their wives, the extra local information about their fields is delivered by women through video calls, sending photos or videos. This situation has masked the fact that women have to make observations in the field as a result of the gender- based division of labor and reproduced the acceptance of them as ecosystem angels who can make good observations, thus reinforcing their position as the "eyes in the field" of the male farmer, the "assistant" of him, and the "worker who helps" male farmer. However, this also created a particular contradiction. In the interviews with male farmers in the lowland, it was frequently mentioned that appropriationism oriented knowledge which is identified with rationalizing agricultural production is under the control of men. They pointed out that women farmers do not "understand" or "know" about diseases and pests and that they "do what men say". On the other hand, when same male farmers responded to questions about early warning messages, they stated that they received information from women, that they actually made decisions based on female farmer's observations and warning messages coming from them which they believe it is most accurate information, reliable than digital farming.

7.3.3. Reproduction of prioritization of economic interest

Horticulture / Field Agriculture Distinction

Farmers also frequently reported that the early warning messages were not inclusive that they are only for horticulture not for field crops. Mehmet (35, Lowland, Safibey), a tomato, pepper and celery grower, put it this way:

> Field farmers do not receive these messages. For example, I grow tomatoes, peppers and celery. Gardening is a single crop, it is easier. That is why it is more common in the lowland. But we are the ones who plant one crop after another, so we are the ones who need information. Where is the message of celery, show me? It is prioritized because the economic value of gardening is higher.

Polat (35, Lowland, Bayat) interpreted the limitation of messages related to gardening as follows:

> The field agriculture is very active, it is very difficult to measure. I remove a crop and plant another, we sow and plant continuously without taking a break, we do not spear fallow time. At least two crops can be harvested from the same place in a year, maybe three. Gardening has a higher return, but you have to have the capital to wait. Once you plant a tree, you have to wait five years. In fact, field agriculture is much more difficult, so there is a need for information and early guidance much more than gardening.

Mümtaz (52, Lowland, Bayat) agreed with Polat's words as follows:

> My job is celery, spinach, melon, watermelon. I don't get messages for any of them. They come for vineyards, quince, walnuts, olives. Garden products are the most widely produced in the region. The field comes later. But we need information more than them. We get three crops in a season, tomatoes end and spinach begins, spinach ends and cauliflower begins, cauliflower ends and celery begins. Field agriculture is not fixed like gardening, gardening is easier, just plant a tree and you're done.

The fact that digital agricultural stations are limited to horticultural crops is an indication that early warning messages are organized according to the agricultural economy of the region. Early warning messages are limited to horticultural crops with high economic returns in the region, and the goal of sustainability is based on horticulture. On the other hand, this situation produces another contradiction specific to the installation and use of digital agricultural technologies in Geyve. Intensive fertilization and pesticides are used in field agriculture, and the aim is to obtain three crops from one unit. Field agriculture stands out in terms of the damage it causes to the ecology but has been excluded of the digital agriculture because it is behind horticulture in terms of agricultural economy. Similar to the commercialization of access to information in input-intensive agriculture, big data-driven information is socialized by including crops with high economic returns and excludes the others. In other words, the ground of sustainability on which the state's digital agricultural stations have risen has been incorporated by intensive agriculture in practice, and the use of these stations and the dissemination of big data-driven information has been reorganized within the framework of the knowledge market (Leewis, 2006), where economic concerns override ecological concerns (Keyder and Yenal, 2020).

Lowland/ Mountain Distinction

The fact that the main actor delivering big data-driven information to farmers is the dealers, and that this delivery is organized in a way to benefit the dealers has resulted in the exclusion of mountain villages from the system. Just like intensive agriculture, the dissemination of big data-oriented information has resulted in discourses such as "the mountain does not need this information", "priority is given to the lowland", "It is more important to send messages to farmers of the lowland". This is clearly seen in the words of Mustafa (46, pest.dealer): "It is true that we send more messages to those in the lowland. We have more customers from there. and it is more difficult to deal with the diseases there. Besides, farmers from mountain already can voluntarily go and register to the system.” Recep (46, pest.dealer) has the following to say about the reproduced mountain/lowland distinction:

> We don't have many customers from mountain villages. They don't need these messages either, how much production do they do? These messages are not that much important anyway. It means that the spraying time is close and farmers need to come to us. When they come, we check the spraying schedule, do not reduce the amount.

Farmer families in mountain villages, on the other hand, do not know "what" an early warning message is and for what purposes the system is set up. When Ferhat (60, Mountain, Akdoğan) attributed this to the fact that "cell phones do not work everywhere in the mountains", his son Furkan (35, Mountain, Akdoğan) objected to him as follows: "Dad, stop being optimistic. Is there no signal at all? If one doesn't come, another one will. This is simply not caring us, forgetting, ignoring." İbrahim (57, Mountain, Çine) stated that they received messages from “poisoners” on holidays and Eids, but not informational messages similar to early warning messages and added:

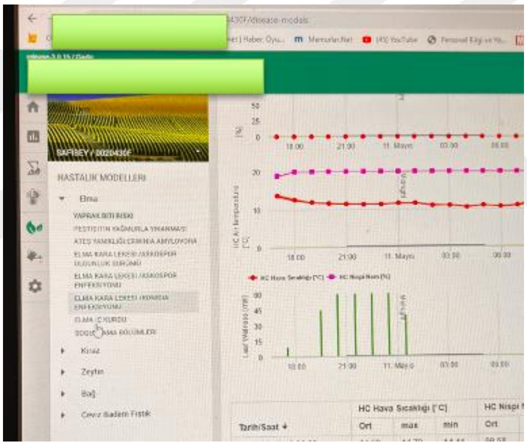
"Rural areas need information the most, more than anywhere. Is that technology you are talking about only for the lowland? "

Mountain villages, which were pushed to the peripheries of the socialization of agricultural knowledge as a result of appropriation and commercialization, again excluded from the socialization of big data-driven knowledge. Farm families in mountain villages, which are not prominent in the agricultural economy as in field agriculture, are excluded from the definition of sustainability targeted by digital climate stations. Prioritizing the data of products and geographies with high economic returns, and delivering the data to the male farmers of the geography reproduces distinctions already existing in intensive agriculture. The regulation of digital farming stations has reproduced the existing inequalities and power/knowledge struggles of intensive agriculture It was also revealed that another dimension that weakens the validity and reliability of early warning messages, other than deviations due to technical deficiencies, is that early warning messages sent from the Provincial Agriculture Department do not reach the farmers directly. During the dissemination of these messages, commercial consultants have to step in and the messages are to some degree reorganized to the economic interests of the dealers. It is possible to read this situation as a result of the weakening of the state-farmer relationship with the structural transformations experienced historically and the filling of this gap by commercial advisors. The incorporation of digital farming stations by commercial advisers has transformed them into mere "information" messages and tools that reinforce the spraying programme and increase interaction between commercial advisers and farmers, rather than transforming it in terms of ecological benefit. In this way, the access barriers created by the commercialization of information in the mountain/lowland distinction are reproduced with expressions as such “mountain villages do not need these messages " and "it is normal for those in the plain to be prioritized".

In order to understand how all these contradictions are seen by the Provincial Agriculture Department, which processes data from digital agricultural stations and transforms them into early warning messages, this time I made my way to the center of Sakarya.

Legitimization of distinctions

Metin (44, provincial direct.) who specialized on the digital climate stations stated that sending early warning messages is primarily a part of public extension. The stations donated by the Ministry are integrated into public extension services. Agricultural engineers working at the provincial directorate use this system, interpret the data from the station, and big data-driven information is sent to everyone registered in the system. Two agricultural engineers working at the provincial directorate of agriculture are responsible for seven digital agricultural stations established in four districts of Sakarya[44]. Data from these stations are combined with pheromone trap information from district agricultural directorates and sent as early warning messages to those registered in the system. The modules in the digital agriculture stations are limited to fruit growing in Geyve. Information on quince, apple, grape, olive and cherry modules is collected through digital sensors.



Photograph 7-21: Interface of the digital climate station that is used by Metin

This information is also combined with information from the district agricultural directorates' pheromone trap counts in the region. Pests caught in the traps show the pattern of the increase in the number of pests in the region. This pattern is analyzed by agricultural engineers in district agriculture and the provincial agriculture is informed that the pest population in the region has reached the economic damage threshold. Interpreting both the data from the digital climate station and the pheromone trap information together, engineers working in the provincial agriculture inform everyone registered in the system about pest warnings and spraying time. Metin (44, district direct.) explained how early warning messages are generated. He remarked that the graphs obtained from the station were examined in detail, along with the pheromone

[44] I learnt that the second person in charge of the digital farming stations was on long-term leave, so I was only able to interview Metin.

counts from the region. As a result of the evaluations made, they prepared the early warning messages registered in the system. He remarked that the early warnings guide farmers to apply the right amount of chemical inputs at the right time, thus reducing the use of chemical inputs in production as follows:

> Farmers in Geyve use pesticides very intensively. Some of these parts are extra. It is possible to use less chemicals with the right treatments at the right time. This is our aim. We do not make decisions by sitting in the center and looking at the screen, we also examine the pheromone trap data in district agriculture. But of course, there are mistakes because only two people look at the whole Sakarya. Nevertheless, I think that sustainability is strengthened in this way and less is given to nature.

The ways in which inequalities and distinctions already existing in access to information are reproduced with the installation of the stations are revealed in the words of Metin. For example, the reproduction of the mountain/lowland distinction is manifested in the following sentences:

> All stations are established in lowland. The volume of agricultural production in the mountains is very limited compared to the lowlands, and the production pattern is also very scarce. We send the messages to everyone registered in the system according to the data of lowland. If farmers in the mountain villages are registered in the system, they are probably receiving them as well. They could interpret the lowland data according to their own situation.

Metin stated that the stations prioritize the lowland due to the production volume and that the information is sent to everyone registered in the system based on data of lowland. He expected farmers in mountain villages can make their own adjustments to adopt information of the lowland. On the other hand, he is not aware of farmers in the mountain don't even know these messages and digital stations existed let alone "adapting the data of lowland". Moreover, he also emphasised the crop distinction by indicating the fact that the system is based on horticultural crops and added: "The agricultural economy in Geyve depends on horticulture. Therefore, the economic loss can be much more severe. In addition, field agriculture is very variable, it is not possible to measure it from the center."

When I asked whether commercial advisors in Geyve could produce its own information and make its extension as a solution to localize information, Metin indicated that he was speaking on behalf of the state and continued as follows:

> It would be to show what the state cannot do. We make our measurements very precisely. How will they know what we do not know? By this way, it would be remarked that farmers don't listen to the state, listen to us. It would be double-headedness. The farmer will be confused which information is right. The state is responsible for agricultural extension and should remain so.

While state prohibitions on extension prevent farmers from making efficient use of early warning messages, the limits of the socialization of big data-based knowledge are determined without negotiating with the realities of the field. In this way, I observe that digital farming stations have been set up on the basis of the progressive nature of technology without analyzing the fault lines of the relationship between the state, farmers and commercial consultancies. It has been revealed that the digital agriculture transformation which aims to make agricultural production in Geyve sustainable through digital climate stations with state support, was designed without being associated with the social. In other words, intensive agriculture has appropriated the use of climate stations and arranged big data-driven information in its own favour by reinforcing already existing distinctions and inequalities. The diagram below shows how digital agriculture in Geyve reproduce of particular distinctions of intensive agriculture and have certain implications on socialization of agricultural knowledge.

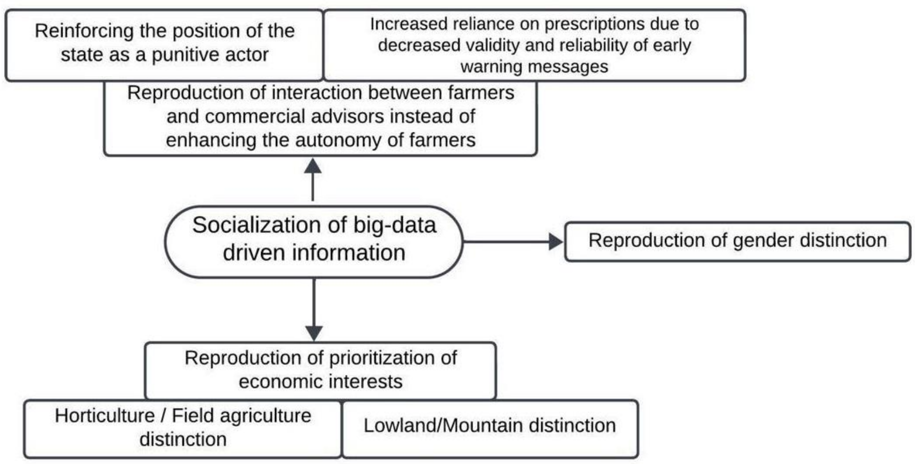


Figure 7-8: The implications on digital agriculture on socialization of agricultural knowledge in Geyve

As can be shown in the diagram above, In Geyve, digital agriculture, which was envisaged to empower farmers in the fight against the climate crisis, has not only failed to achieve such a function, but has also created its own contradictions and crises. The establishment of digital agriculture does not associate with the social and does not contribute to ensuring sustainability in agricultural production. Agricultural realities based on digital climate stations and the agricultural realities of the field do not coincide with each other. Digital agriculture, which is expected to repair the ecological damages caused by intensive agriculture, is found to reproduce the contradictions specific to intensive agriculture. The definition of sustainability of digital agriculture in Geyve is not inclusive, it contains clear distinctions. These distinctions primarily stem from the fact that the socialization of big data-oriented information is determined in favour of market relations. The fact that the modules used are limited to horticultural products which have high economic values and exclude field production. Although its value to the agricultural economy in the region is lower than horticulture, agrochemicals are consistently used very intensively to grow field crops, which can be more damaging to the ecology than horticulture. It is therefore a contradiction in terms that field crops are not covered by this technology which is designed to reduce the ecological damage caused by intensive agriculture. Moreover, big data-oriented knowledge is again designed to be socialized among men. The fact that only men's phone numbers are registered in the system has prevented women from accessing this information from the beginning. Thus, within the framework of input-intensive agriculture, the gender distinction that emerges in the socialization of appropriationism-oriented knowledge is reproduced withing socialization of big-data driven information. Furthermore, the fact that all of the stations in Geyve are located in the plain and exclude the countryside from digital transformation reveals another distinction within the definition of sustainability in digital agriculture. It has been determined that these stations reproduce the distinction between lowland-mountain and center-rural. The data of the lowland has been superior to the rural. On the other hand, the limited number of stations and the fact that they are not placed according to microclimatic characteristics cause deviations in measurements. These deviations considerably damage the validity and reliability of early warning messages. In addition, due to the weakening of the state-farmer relationship, early warning messages produced by the state are largely communicated to farmers by commercial consultants, with their reorganization according to the economic interests of dealers. Tactics to reduce the cost of mass message delivery further undermine the validity and reliability of the message. The fact that the only actor that can produce big data-based information in the region is the state, through the Provincial Directorate of Agriculture, hinders other endeavours. This situation reinforces the positioning of the state as a punitive and prohibitive actor in the eyes of farmers.

The fact that digital farming stations do not make a meaningful difference to underpin sustainability in Geyve extends far beyond these technical adjustments. Failing to see that the problem is structural and related with social relations and imagining that it will be solved by technical adjustments, is a technical fix as Cook et al. (2021) or rendering technical (Goodman and Redclift, 1991). Even if digital farming stations undergo technical adjustments to ensure their validity and reliability, they will not correspond to social reality, and the definition of sustainability will not be inclusive. In other words, the problem that the technology fails to result in more ecological and sustainable agricultural production is social rather than technical. It is seen that this technology, which is expected to provide predictability to farmers in the fight against the climate crisis and strengthen their autonomy, deepens the existing crises and adds new contradictions on socialization of agricultural knowledge.

8. DISCUSSION

I spent part of my life in Munich. I used to take long walks in the "Englischer Garten" and occasionally pick up novels and poetry books from the peddlers. It was then that I came across the book "Um die Dinge ganz zu lassen" "to leave things whole" (2015) by Thilo Krause, one of the representatives of contemporary German poetry. His verses on topics such as the flow of time, sounds, objects, the relationship between part and whole left traces in my world of thought. In the course of developing my main theses on the socialization of agricultural knowledge in Geyve, I found myself taking a long walk in the Englischer Garten and rethinking Krause's poems. In the discussion chapter, I aim to connect the literature, the conceptual framework, historical analysis with the findings from the fieldwork with *conceptual sticks* in order to integrate the parts of the study with each other. I aim to convey what the discussions I conduct eventually reveal, what they refer to and tuning their positioning in social theory. In this way, I attempt to enable a deeper reading, comprehensive understanding and a proper evaluation of my study by both distorting concepts or applying new conceptualizations. I aim to make a contribution to the literature of agricultural extension and communication studies by introducing the rhythms of the social sciences in a way of the poet sings *as if to create space between things, as if for the sake of silence in the storm*[45] and to *leave* my thesis *whole*.

8.1. Epistemological crisis in Geyve: Non-socialization of agricultural knowledge

Within the framework Science and Technology Studies, by relying on Foucault's thinking that knowledge is a social product that shapes and is shaped through power relations, I define socialization of agricultural knowledge as a complex process of interactions in which a variety of social actors are involved through power/knowledge mechanisms. My first key finding is that emerging power/knowledge mechanisms

[45] "Es gewittert und ich trage dich von Zimmer zu Zimmer... ich singe, wie um der Stille willen / wie um Platz zu schaffen zwischen den Dingen. / It thunders and I carry you from room to room... I sing, as if for the sake of silence / as if to create space between things." (my trans.)

through socializing agricultural knowledge are fundamentally dependent on the forms of agricultural production. In other words, power/knowledge struggles are shaped by the agricultural mode of production. The journey of agricultural knowledge in Geyve unfolds differently in the lowland (center), where input-intensive production is dominant and, in the mountains, (rural) where subsistence production is prevalent. As I explain in detail above, agricultural knowledge is socialized in the Geyve lowland through the mechanisms of commercialization, medicalization, and patriarchization. On the other hand, in the mountain, a Foucauldian battle for truth is occurring in the context of conflicts between the mechanisms of preserving indigenous knowledge, structural isolation, and commercialization. Although there are certain distinctions, the publicity that is required for socialization agricultural knowledge has been destroyed to a great extent, alienation of agricultural actors in their interactions with themselves and the environment has escalated, resulting in social connections transforming into "relation of relationlessness" (Jaeggi, 2014). In accordance with this dissolution, agricultural knowledge is largely detached from its historicity and sociality. In today's Geyve, information is turning into an entity that cannot be accumulated, experienced and constitute knowledge and that the integrity of knowledge is being fragmented, dissociated into pieces of information. Power/knowledge struggles ultimately results in what I conceptualize as *atomization of agricultural knowledge* in case for Geyve lowland and *agricultural deterioration* in case for mountain. Through these two conceptualizations, I argue that socialization of agricultural knowledge in Geyve is in fact a state of non-socialization of agricultural knowledge, in which the decision-making of the farmer is largely destroyed and it ultimately turns into an epistemological crisis[46].

As explained in detail in previous chapters, the emergence of such epistemological crisis has historical roots. Behind it, there are certain historical breakdowns respectively as the fading presence of the state in agricultural knowledge generation and extension processes, the privatization of advisory systems and the realization of corporate concentration as knowledge purveyors. With the reorganization of the Ministry of Agriculture in 1984 and the implementation of neoliberal policies, public policies in the production and dissemination of agricultural

[46] Through this conceptualization, I refer to the etymology of crisis in Latin that indicates decision, select, judgement. Through the mechanizms I identified the agency of farmers are destructed to a great extent which results in an unstable situation in decision making process which renders an epistemological crisis.

information started to fade, corporate concentrations started to increase and advisory services started to be privatized. In this historical process in which the protectionist hand of the state weakened and farmers were "left on their own", agricultural consultancy turned from being a public service into a commercial service. Before 1984, through agricultural extension activities, which were quite active compared to today, the state considered it as a public service to be in the field and support farmers with the technicians and engineers it trained and appointed. Agricultural engineers who are "not afraid of stepping in the mud" make field trips, go "at the feet of the farmer", while farmers test the engineers according to their own knowledge, and the contest between experiential knowledge and scientific knowledge used to continue. On the other hand, today the agricultural extension activities of the state are very limited. With the transformation in 1984, the state, which sends human resources (technicians, foremen, engineers) representing scientific knowledge to the villages, first removed the practical courses in agricultural education from the curriculum, distancing the relevant actors from the realities of the field, and then limited their interaction with farmers by confining them to offices and burdening them with documents. This lack of interaction indicates a move away from the publicist understanding that considered extension services within nation-state development before 1984. Again in 1984, with the "participatory extension" project implemented by the World Bank in Turkey, the farmer was re-positioned as a cost-sharing agent in accessing information. In other words, agricultural engineers working in the public sector were turned into desk clerks and farmers into customers who purchase information. This disconnect between the state and the farmer has been filled by agricultural supply companies, distributors, cooperatives and agrochemical dealers. Today, the farmer in accordance with the neoliberal agency assigned to him is positioned as a cost sharing individual, as an entrepreneur who can access the most accurate source of information through his own efforts and commercial advisories become the dominant knowledge purveyors. The mechanisms that reinforce the power of appropriationism, which has largely deconstructed agency of farmers and disempower them in decision making and renders an epistemological crisis.

Epistemological Crisis in Lowland: Atomization of Agricultural Knowledge

The epistemological crisis I refer in Geyve lowland is not independent from the crises of modernity. Modernization has accelerated history by expanding the present by detaching it from the interconnectedness of the past and the future (Koselleck, 1988). In this acceleration, the reduction of the time span to the present has reduced the reliability of experience that lead dissociation between information and experience (Rosa,2010). In the accordance with increasing slippage of present (Schwarz, 2010) appropriationism has become dominant in agricultural production. The industrialization of agriculture has increased the use of chemical inputs and reduced the dependence of agriculture on natural resources to the maximum level. This process, conceptualized as metabolic rift (Keyder ve Yenal, 2013, Demirer, 2012, Foster, 1999) can also be considered as reducing the time of ecology to the present. The "metabolic rift" has turned into a kind of extra-present pressure in agricultural production due to the fact that historically and geographically accumulated ecological time has been replaced by fast-acting formulas, prescriptions and agricultural chemicals. Within the scope of modernization of agriculture, farmers were declared incapable of rational, scientific management by agricultural specialists, who sought to replace farmer knowledge with industrial logic (Fitzgerald, 2003). Agricultural professionals asserted that farmers lacked the ability to engage in logical and scientific management, and sought to replace their knowledge with an industrial rationale (Fitzgerald, 2003). Also, with the rise of commercial advisers, the ensuing uncertainty gave rise to a market for the agricultural industry's separate commercialization of various farming processes, a practice known as appropriationism (Goodman, Sorj, and Wilkinson,1987). Efforts of commercial advisories to reduce dependence on natural resources and rationalize production has commodified the inputs used in production such as seeds and agrochemicals (Flachs and Stone, 2018). The commodification involves seeds and agrochemicals being aggressively branded and sold in a confusing market defined by commercial specialization, which distorts farmer knowledge (Fitzgerald, 1993; Stone, 2007). Commodification is not just the alienation of workers from their tools, but also the promotion of labor that destroys social bonds and knowledge management skills (Flachs and Stone, 2018). The degree to which components of each crop's cultivation are commodified determines how these crops are cultivated, sold, and learnt about. The variability observed indicates a range in which the level of farmer knowledge and the extent of commodification are inversely correlated. Maintaining a general knowledge to manage commodified seed disrupt local knowledge (Brookfield, 2001). Flachs and Stone (2018) imply that commodification of seeds impacts farmer “skilling” by weakening experience-based agricultural knowledge. I approach deskilling of farmers in the face of appropriationism which commodification of inputs are embedded as a dissociation between experience and knowledge which diminish their agency. Experience has lost its own value and has come under the sovereignty of an arrangement outside itself (Ahıska, 2002: 116) which is appropriationism. Farmers have become surrounded with instructions for use of the agrochemicals and weaken farmers' questioning power. The mechanisms of commercialization, medicalization, and patriarchization, which reinforce the dominance of appropriationism, are in line with the acceleration of time and expansion of present, resulting in a loss of experience and tradition in Geyve. The local knowledge of farmer which is based on experience and observation that live in warmth of tradition, in the silence of custom (Rosa, 2011) has been undermined to a great extent through prescriptions of dealers. In other words, historical continuity of local knowledge is largely displaced with extra present of prescriptions. In other words, the instructions contained in prescriptions, which cannot be experienced but only applied, instrumentalize agricultural information by reducing it into one-dimensional entity. I conceptualize it as "atomization of agricultural knowledge". The appropriationism has resulted in dissociation between information and experience. Indigenous knowledge which is based on experience and accumulated by passing down from generation to generation of farmers weakened by commercialization of advisory services and instructions for use of prescriptions.

Moreover, Stock and Forney (2014) argues that the weakening link between the state and the farmer has accelerated the establishment of agricultural advisory services, that the commercialization of advisory services has created a knowledge market full of constantly renewed chemicals of brands, offering farmers a wide range of alternatives to meet their specific needs as a result of transforming agricultural advisory services from supply driven to demand driven. But this explanation is inadequate in today's context. It is true that large-scale producers can make agreements with different companies, question recommendations, and access the products they demand in line with their purchasing power. On the other hand, this is not the case for small-scale farmers. The customer-service provider relationship between small-scale farmers and dealers has transformed into creditor-debtor relationship. Small-scale farmers handle themselves by borrowing from their dealers. In return for this debt and management, dealers receive implicit promises from farmers that they continuously purchase agrochemicals from them. Farmers who have to buy seeds, fertilizers and pesticides from the same dealer have lost their questioning capability to great extent.

Moreover, in the face of the speed at which the market renews itself, farmers are not equipped and competent enough to question the prescriptions of the dealers. It is possible to consider the renewing knowledge market in terms of Baudelaire's (2007) quote "the world is not going to be the same next morning", which expresses that modernism consists of constant changes and fleeting moments, or Bauman's conceptualization of fluid modernity (2000) in which "the only thing that does not change is change and the only thing that is certain is uncertainty". The realization of fluid modernity through agricultural knowledge processes is through the ever-changing agrochemical prescription of appropriationism, which represents instrumental rationality. The absence of a pesticide with long-term observed effects, unavailability of the product, limited ability to inquire about alternative suppliers, and concerns about debt collection serve to bolster the authority of prescriptions and perpetuate the unidirectional flow of information. The organization of prescriptions according to the means of the dealer, according to the "products at hand", shows that consultancies have largely lost their demand-driven characteristic for small farmers. As the power of appropriationism oriented knowledge increases in this fluidity, local knowledge is lost, alienation increases, and social relations turn into in Jaeggi (2014) words “relations of relationless”. Other than defining alienation as the rupture or absence of relationship, she explains it as a relation of appropriation. According to Jaeggi alienated are surrounded by unrelated relationship emerges from disempowered subjects who no longer experiences itself and the loss of the experiential content within the experience. In this case, it is possible to say that the small farmer in the Geyve plain is trapped in unrelated relations and has lost his agency to a great extent by being trapped in the creditor-debtor duality. It is quite possible to see this type of relationship, which Jaeggi (2014) defines as "to have oneself at one's disposal", in expressions such as "if water is given, we will throw water", "the dealers are the bosses, we are the laborers", "we are obliged to the dealers", "the system is like this, it will not change", used by small farmers to describe their predicament in decision-making processes.

The dissociation between experience and knowledge has also led to the destruction of social memory in Geyve and in this way reinforce epistemological crisis. Social memory (Halbwachs,1992) which brings together the experiences of the actors of agricultural production on a common ground is a bridge between the past and the future. On the other hand, with the commercialization of agricultural consultancies, the farmer has turned into a cost-sharing individual in accessing information. This individualization has disrupted the sharing of knowledge, experience and observations between actors. Just as modernization has personalized the consumption culture of the individual, the information needs of farmers are prepared with personalized prescriptions. As the seeds and agrochemicals are exposed to acceleration of commodification and being aggressively branded, the common ground of experience diminishes. Farmers share their observations on the processes of appropriationism in agricultural production with each other in village cafes, at agrochemical dealers, in the field, and compare prescriptions. On the other hand, the constant renewal of the products, aggressive branding, acceleration of commodification of agricultural inputs weakens the questioning capability of farmers. In addition, the commercialization and individualization of agricultural consultancies may disrupt the relationship between farmers. In order to combat the competitive pressure of the market, farmers may share misinformation with other farmers in order to promote their own products. Discourses such as "One does not laugh until one cries," "One will be disgraced so that one will be a king" point to dissolution of the social that implies socialization of agricultural knowledge become a state of non-socialization. Moreover, I spent a lot of time in the field at pesticide dealers. During this process, I repeatedly observed farmers coming to the dealer with the prescriptions given to them last year, only to find out that the existing pesticides had changed. Through participant observation, I heard several times “That's last year's medicine” or "These prescriptions are updated every year like mobile phones". Based on this, I argue that agrochemical dealers, who drag farmers into the position of consumers of information through the mechanisms of commercialization and medicalization, reproduce the "planned obsolescence type of forgetting" that Connerton (2008) mentions in the context of consumer culture. Connerton claims that planned obsolescence is embedded in consumer culture. He claims that it is the driving force behind the renewal of our phones, computers and clothes. He states that the profitability based on competitiveness is maintained with the discourse of "newness" and that products are constantly updated and produced to be short-lived in order to increase consumption, and that the previous one is planned to be forgotten. The concentration of companies in the knowledge production process has led to profitability being derived from the sale of agrochemicals and agricultural knowledge being subjected to the competitive pressure of the market. Constantly renewed agrochemicals make the previous one forgotten in a planned way. The acceleration of the market is not at a pace that the farmer can follow, and therefore the farmer's agency in decision-making is diminishing and local knowledge has become dysfunctional. I see that the "planned obsolescence type of forgetting" carried out by agrochemical dealers has turned into a means of detaching agricultural knowledge from its historical continuity and sociality which results in instrumentalization of information and ultimately results in loss of social memory. Farmers feel the epistemological crisis that envelops them more when prescriptions become dysfunctional. Although agricultural knowledge has become one-dimensional, ecology continues to be multi-layered and complex. When prescriptions fail, for example, in the case of a "blackening of wheat" type of disease caused by extreme weather events, farmers could neither act according to their traditions, ancestral knowledge and past experiences, nor find a cure through prescriptions. Likewise, for powdery mildew disease, which has not been seen in quince before, there is no prescription for a cure, and farmers cannot find a solution based on their own experience by recalling social memory. Likening these situations to being in a kind of limbo, farmers stated that they could neither go forward nor go back to the past, and that they felt so helpless in their decision-making processes that they would "throw water if they were given water". It has become clear that the climate crisis is intertwined with the epistemological crisis.

The focus of agricultural production on efficiency and profit maximization has disassociated agricultural knowledge and create discontinuities in another way. This time, the accumulated knowledge is transformed into pieces of information. The uncertainties caused by the climate crisis, for example extreme weather events, seasonal deviations and disasters, added to the uncertainty brought about by the lack of planning in production, have caused farmers to have difficulty in making money. They may give up crops that do not make money for several years in a row and turn to crops that they are unfamiliar with, but from which they can make more profit. The farmer, who is also unfamiliar with the knowledge of the unfamiliar product, is once again subjected to prescriptions that he or she has not experienced. An example of this is the recent decline in the yield of quinces affected by extreme weather events, which have been cut down and replaced by persimmon and nectarines, which are expected to bring more profit. The farmer, who is the master of quince become the apprentice of nectarine which lead him to strive like an entrepreneur to find out which source of information is right for him. The knowledge of the quince producer, who has been dealing with the same product for years, is fragmented. However, it seems that what happened to the apple, which was dominant in the region before the quince, will be repeated for the permission or nectarine after the quince. The conceptualization of "atomization of agricultural knowledge" operates this time in terms of the dissolution, fragmentation and interruption of knowledge into pieces of information. In addition, the absence of production planning, the absence of the state as an actor supporting the decisions of farmers leads to discontinuities by dissociate agricultural knowledge into information pieces and reinforce epistemological crisis.

Farmers who strive to overcome this epistemological crisis and preserve their autonomy in the face of the aforementioned commercialization and medicalization are generally observed as medium-scale producers. This group does not have as easy access to information as large-scale producers, nor do they have to remain in a subordinate relationship with dealers (information sources) as small-scale producers. With the limitation of agricultural extension, which has a collective character, and the commercialization of consultancies, it is seen that the form of access to information has become individualized. As a result of this individualization, farmers try to find the most appropriate information for themselves according to their means by participating in different information networks, receiving support from different actors, and using social media tools. Like a kind of entrepreneur, they strive to access the most accurate source of information through their own efforts. In this process, they develop tactics against the mechanisms of commercialization and medicalization that consolidate power and perform everyday forms of resistance. These highly individualized and temporary forms of resistance do not give rise to an organized resistance that transforms the input-intensive agricultural structure, which is one of the biggest causes of the climate crisis. Medium-scale farmers strive to turn the processes of knowledge production based on corporate profitability in their favor through De Certeau’s (1988) everyday tactics or, as Scott’s everyday forms of resistance. For instance, one might assess the credibility of pesticide sellers' recommendations by cross-referencing them with information from other sources, such as independent actors. Additionally, gathering perspectives from participants outside the region can provide a broader understanding. On the other hand, the individuality of this effort is not enough to overcome the epistemological crisis that the agricultural society is facing at this stage of history.

Another emerging mechanism of socialization of agricultural knowledge that reveals the epistemological crisis in the lowland is patriarchization. This mechanism initiates questioning the gender of the farmer. As discussed in detail in previous chapters, with modernization of agriculture, male farmer become “boss” and decision maker (Plumwood, 1993; Flachs, 2018), female farmer is considered a laborer who is being ruled by male farmer. Discrimination based on gender ignores women's knowledge, declares it as irrational, and subjects women's knowledge to a patriarchic epistemicide. It is evident that the decisions made by male farmers, who determine agricultural input utilization rates and aim for maximum profitability in production, reinforce the climate crisis. As discussed in the previous section, due to the historically established gender-based division of labor, women have the knowledge and are familiar methods to eliminate the destruction of the ecosystem. On the other hand, they are unable to operate this knowledge due to patriarchic dominance. Masculinity of appropriatonism-oriented prescriptions has reproduced the process of irrationalization. Women internalize the masculine gaze to such an extent that their categorization of the language they use as "folk language" reproduces irrationalization. Nazaera (2017) states that female farmers are custodians of local knowledge in the agrarian society. However, I noticed that while female farmers retain local knowledge and have an expertise in agroecological approaches, I discovered that this knowledge becomes obsolete, loses its effectiveness and becomes stagnant since it cannot be put into practice. Through my long-term field observations and "Work and Talk" ethnographic technique, I discovered that the assertion of Nazera (2017) is widely invalidated and that women have internalized input-intensive agricultural techniques and knowledge. They often asserted that "local knowledge is useless, an outdated word" and that “use of pesticide is a must”. The irrationalization of women's knowledge and the exclusion of women from decision-making processes, the partnership of patriarchy with medicalization and commercialization mechanisms, exposes women's knowledge to epistemicide which reveals that the epistemological crisis in Geyve is a gendered task.

Epistemological Crisis in Mountain: Agricultural Deterioration

Within the mountain villages, a distinct form of epistemological crisis is unfolding. I argue that the epistemological crisis in Geyve’s mountain has been emerging as a result of what I conceptualize *agricultural deterioration.* As discussed in detail, agricultural knowledge is socialized through the mechanisms of preserving indigenous knowledge, structural isolation and commercialization. Public extension services, such as walnut pruning trainings and training activities connected to olive and vineyard organized by agricultural engineers of district agriculture are not available in mountain villages. The interviews conducted with farmers in mountain villages do not show the involvement of engineers from the district agriculture department as actors to be consulted in decision-making processes in mountain. In addition, farmers have expressed that pesticide dealers display less concern for them primarily because of their small-scale production compared to farmers of lowland. They perceive this structural isolation as being excluded and disregarded, being labeled as "peasants," "second class," and "insignificant" by both the state and companies. Interviews conducted with pesticide dealers and engineers in district agriculture show that their communication with farmers in mountain villages is significantly constrained. Public engineers stated that they "cannot spare time for the mountain while they can't even reach the lowland", while commercial consultants stated that "there is not much in the mountain villages" and that "it has a cost to visit mountain". State institutions and commercial consultants that neglect to address the information demands of mountain farmers expose them to structural isolation. This destruction takes place in the form of not meeting the information needs of the mountain villages, not taking care of their agricultural problems, and not finding a contact person from either the public or the private sector who hears the farmer's voice. Due to fact that the farmers' information requirements remain unfulfilled, their state of structural isolation undermines their capacity in decision-making processes. Epistemological crisis in mountain is manifested in mountain as transforming agricultural extension to agricultural deterioration.

However, in the region where capitalist penetration is limited, farmers show certain forms of resistance to preserve their indigenous knowledges, largely rejecting input-intensive agriculture practices, as opposed to everyday forms of resistance or tactics emerging in the lowland. Among the forms of resistance there are keeping the production pattern constant, raising livestock, preserving and using indigenous knowledge and tradition in decision making, consciously keeping the small scale of production, continuing with subsistence farming. Farmers in mountain who see themselves as "part of nature" state that they are "embedded with the course of climate change" and that making decisions based on experience has never misled them. relationship they establish with themselves and the ecology is far from instrumentality and that they benefit from accumulated knowledge based on experience and social memory in their decision-making processes strengthens the agency of farmers. Therefore, it is possible to say that agroecological knowledge strengthens farmers' agency, lead them become “children of time” in their own words. On the other hand, under the competitive pressure of the market, the poverty of rural farmers is increasing and this situation leads to the alienation of the younger generation from agriculture. According to the interviews, the desire of the younger generation to live in urban centers and pursue diverse career other than being farmer suggests that the transmission of knowledge from one generation to the next has become limited and disrupted. Consequently, social memory is at risk of being lost due to the inability to pass down experiences and indigenous knowledge. Inability to transfer local knowledge and experience, manifests itself in discourses such as "We are the last generation" and "After us, the grave". The discontinuity in agricultural knowledge is realized this time on the mountain through the "interruption of accumulated knowledge and the inability to transfer it". Farmers are witnessing the loss of social memory and experience, disintegration of the agricultural society in their region which deepens agricultural deterioration.

In addition to this, some families in mountain villages have started to shift to input-intensive agricultural practices in order to break the structural isolation they are surrounded, to escape the economic disadvantages of subsistence farming, and to mitigate the effects of agricultural deterioration. Farmers who purchase high-yielding crops and prescriptions stated that they "had to leave local knowledge aside" and that they "could not survive without making money". This is seen by other farming families as a kind of erosion of local knowledge. Local knowledge and appropriationism oriented knowledge are colliding, two different realities are taking place and a Foucauldian battle for truth is emerging. The fact that the deep-rooted indigenous knowledge, which is passed down from generation to generation, based on experience, begins to encounter appropriationism and one-dimensional instructions for use. Indigenous knowledge and experiences of farmers cannot find a public sphere where it can be transmitted to the next generation which points to the dissolution of the agricultural society. Farmers who continue their production with agroecological methods and make decisions using local knowledge witness this dissolution by saying "We are the last generation" and "There is no one after us". In this context, rural farmers can be metaphorically compared to “angel of history” that Benjamin (1969) introduces in the “Thesis on the Philosophy of History”. Just as the Angelus Novus turns its face to the catastrophe of the past and cannot flap its wings except to stare at the wreckage[47], rural farmers are witnessing the alienation of the younger generation from agriculture, the exploitation of agricultural lands for non-agricultural use, the abandonment of the countryside, and the spread of input-intensive agricultural practices. In other words, they stare that in the current stage of history, appropriationism is prevailing in the Foucauldian battler for truth.

In short, I contend that the process of socialization of agricultural knowledge in Geyve has ended up in a state of non-socialization of agricultural knowledge due to emerging atomization of agricultural knowledge and agricultural deterioration. This has led to a decline in farmer agency, the capability of controlling decision making resulting in an epistemological crisis. Digital agricultural technologies have been proposed to mitigate this epistemological crisis, support farmers’ autonomy, and assist farmers in making the correct decision at the appropriate moment.

8.2 Digital agriculture as simulacra

The second finding of the thesis is that the epistemological and ontological assumptions of the agricultural structures assumed by digital agriculture and the agricultural structure I observed in the field are different. The approach of digital agriculture to human and ecology, the social realities it assumes, the actor it imagines as farmer and the realities of the agricultural structure I observed in the field do not overlap. Digital agriculture has been articulated into the existing structure without undermining the dominancy input-intensive form of agricultural production in Geyve. Digital agriculture has been articulated into the existing structure without undermining Geyve's dominant input-intensive form of agricultural production, as well as its founding element appropriationism and the related mechanisms that increase its power, without replacing it with a form of agricultural production that ensures sustainability, and without producing its own definitions of farmer and ecology.

The uncertainty generated by the climate issue is predicted to be reduced to a considerable extent as a result of farmers receiving data-driven information gathered through precise measurements which lead farmers to make better decisions at the

[47] For detailed explanation: Handelman, S. (1991). Walter Benjamin and the Angel of History. *CrossCurrents*, *41*(3), 344–352. http://www.jstor.org/stable/24459948

appropriate time. Due to this claim, four digital climate stations have been established within the scope of the digital transformation move initiated by the state in Geyve. The digital agriculture transformation in Geyve has been realized through digital agricultural stations established by the state. Data on climate events are measured by sensitive sensors, interpreted by the Provincial Directorates of Agriculture, and sent as early warning messages to all farmers registered in the system. Farmers who take this message into account are expected to make their production more sustainable. With the predictability given by big data-driven information, it is expected that farmers that use intensive agricultural chemicals will apply the correct amount of chemicals at the right time, shifting to a more sustainable agriculture that will mitigate environmental damage. Nevertheless, the unfolding of digital agriculture in the field is not as expected, none of these objectives have been achieved in the field of practice. The implementation of digital agriculture has failed to fulfill its promises due to its confrontation with the prevailing input-intensive agricultural production structure and practices. Instead of mitigating the existing epistemological crisis, it has introduced new challenges. The data's validity and reliability have been disrupted due to the limited availability of stations, restricted modules, and installation problems. Additionally, the fact that the stations are entirely situated in the lowland further exacerbates the rural farmer's structural isolation. While the "innovations" "revolutions" "smart systems" brought by digital agriculture are being talked about more and more every day, as Süalp (2012) points out the social references of these technologies are not considered sufficiently.

The implementation of digital agriculture indicates a growing disconnect between the state and reality of agricultural structure in the field. The historical weakening of the relationship between the state and the farmer and the filling of the gap by commercial consultancies cause some ruptures, discontinuities and disruptions in early warning messages until they leave the provincial agricultural directorates and reach the farmers. Farmers who are expected to go to state institutions and register to the early warning system have stopped visiting these institutions for a long time. With the registration of commercial advisors in the system, messages from private experts are delivered to farmers by the SMS systems of pesticide dealers. In this process, information may be merged, warnings may be delayed, and the problem of validity and reliability, which has emerged by technical reasons deepens. Early warning messages, which are obtained as a result of the processing of the farmer's own data by the state for the benefit of the farmer, are delivered to the farmer in a way that has been appropriated, copied and distorted to a certain extent by the socialization mechanisms of agricultural knowledge. While the use of big data-driven information in the reality constructed by digital agriculture supports farmers in their decision-making processes and makes their production sustainable, the reality in the field indicates that this has turned into an element that adds new layers to the existing epistemological crisis.

The fact that farmers claim that they do not take early warning messages into account in their decision-making processes (due to certain technical problems and the binding social relations described in the previous section), that their agrochemical use schedules are predetermined by prescriptions, and that they define sustainability as "maintaining their own existence" and "making money and surviving" indicate that digital climate stations have lost their function and have been reduced to “images”. Digital agriculture, which collapsed inwardly in a way with the non-materialization of the reality it constructed, has been rederived through the realities in the field and copied by existing mechanisms of socialization of agricultural knowledge respectively as commercialization, medicalization and patriarchization. This copied reality has replaced the originality by remodeling digital agriculture. In this case, it become appropriate to recall Baudrillard's (2010) theory of simulation and simulacrum. Baudrillard states that simulations emerge through the loss of the original sending system of a particular reality, the reduction and reorganization of reality into images and thus the boundary between fiction and reality disappears. The fact that big data-driven information, which has some validity and reliability problems due to technical disruptions, that fact that it is copied and edited several times by different actors and delivered to the mobile phones of farmers in the Geyve lowland indicates that these early warning messages have turned into a signifier without a sender, as Baudrillard (2010) puts it. By precession of remodeling, the early warning messages delivered to farmers have completely lost their function as sources of information that warn farmers early and support decision-making processes that provide predictability. Digital agriculture has turned into simulacra that reproduces the contradictions, distinctions and dilemmas of input-intensive agriculture instead of mitigating them. Early warning messages representing digital agriculture, which aims to reduce the rate of agricultural chemical use by enabling farmers to make the right decision at the right time, to provide predictability through precise measurements, and to ensure sustainability through the use of big data-driven information, have lost their authenticity and turned into images that increase the interaction between farmers and commercial consultants. The power/knowledge struggles that emerge in the process of socialization of agricultural knowledge point to an epistemic crisis in which information cannot accumulate, becomes one-dimensional, and knowledge is fragmented into pieces that cannot establish meaningful relationships with each other. The fact that farmers in the current epistemological crisis need to make more complex decisions with the climate crisis and need more information, in other words, the intertwining of the climate crisis and the epistemological crisis, has caused the use of big data offered by digital agriculture to hit these dilemmas in the field. Ultimately, early warning messages which represent digital agriculture in Geyve has become simulacra that has been appropriated by the socialization mechanisms of agricultural knowledge, reified beyond itself, and become compatible with the continuity of the system. Baudrillard has stated that the simulacra are devoid of origin and consists of interpenetrating representations. "Real" digital agriculture requires precise measurements, different measurements for each crop and region, separate examinations per radius of the stations, providing predictability to farmers before decision-making processes and strengthening the agency of the farmer. The content and meaning of digital agriculture have been dissolved, hollowed out and remodeled by the existing agricultural structure in Geyve. Early warning messages that can be delivered to farmers after decision-making processes, where information on different crops can be given together, continue to be sent as early warning messages in the form of simulacra that is to be perceived as a reality as Baudrillard (2010) indicate. Thinking implementation of a few climate stations alone will lead to sustainability in agricultural production, without examining the form of agricultural production itself on the basis of economic, political, and social aspects of input-intensive agriculture reproduce the approach of technological fix (Cook et al. 2021) which fails to address the underlying issues and leads digital agriculture ended up as an illusion.

8.3. A Social Gyrisma: "Society must be defended"

My third main finding is related to the basic premise of the co-productionist framework of Science and Technology Studies, which is conceptual framework this thesis, that technology and society are mutually constituted. When I revisit this argument in the context of digital agriculture and in the field of Geyve, I argue that in order for technology and society to be mutually constituted, at this stage of history, in the case of Geyve, firstly “society must be defended” as Foucault says. By "defending society," I am referring to the need to enhance the farmer's ability to govern and make decisions. Currently, farmers have lost much of their control due to the dominant systems of appropriation and input-intensive agriculture. Additionally, they have suffered from the erosion of social memory and tradition as access to information has become more individualized. The co-productionist framework of STS does not position technology as an external, rational factor that exists outside of society, influencing and shaping it. On the contrary, it sees technology as a particular mix of people, skills and tools (Fernandes and Melo, 2003, p.153). It treats technology not as an autonomous factor determining social changes, not as a collection of techniques, but as a tool for understanding social changes. In other words, technology is not regarded as a neutral expression of pure instrumentality, but as a variable that shapes and is shaped by social relations. As in the case of digital agriculture in Geyve, it has been revealed that a technological development that is thought to ensure sustainability in production can be shaped, transformed and deviated from its original form by social relations. Digital agriculture was implemented in Geyve "as if parachuted in from the sky" without changing the input-intensive mode of production itself, without looking at the social references of this mode of production, without examining the mechanisms of socialization of agricultural knowledge from the perspective of technological determinism as rendering technical (Goodman and Redclift, 1991) or technological fix (Cook et al. 2021). As a result, it has been appropriated by the power/knowledge mechanisms in existing social relations, its own reality has been undermined, deformed and rederived. The early warning messages that continue to be sent as part of digital agriculture have become simulacra within the transformation of socialization of agricultural knowledge into a state of non-socialization.

With the withdrawal of the state from agricultural knowledge mechanisms, the farmer's need for information is met by commercial consultancies, resulting in the capture of experiential content of experience by prescriptions, the loss of social memory to a great extent, and the destruction of the farmer's agency to a great extent. Although large-scale farmers benefit from the knowledge market in line with their purchasing power, small-scale farmers are trapped in a kind of creditor-debtor relationship, while medium-scale farmers try to stretch the limitations of dominant power relations with tactics of De Certeau (1988) or everyday form of resistances of Scott (1985) like entrepreneurs. Since the process of positioning the farmer as a cost-sharing individual in accessing information, which started in 1984, farmers have not been able to build collective resistance to reclaim agricultural extension as a public service, nor have they been able to create a transformative effect in the process of corporate concentration in knowledge production and extension. For the socialization of agricultural knowledge, as Foucault says, it is necessary to defend society first at this stage of history against epistemological crisis that surrounds farmers. Although this crisis takes place in different ways in the lowland and the mountain, it is revealed that farmer knowledge is being atomized and dissolved, and that the increasing concentration of companies in the production of knowledge leads to the loss of social memory by separating information and experience. I argue that in the face of the power of appropriationism, the agencies of farmers in the lowland have been largely destroyed and imprisoned into “relation of relationless” (Jaeggi,2014) by *atomization of agricultural knowledge* and that farmers in the mountain have transformed the “angel of history” in the face of the *agricultural deterioration* they have witnessed. In the context of this dissolution, I argue that Foucault's 1976 argument that "society must be defended" needs to be revisited. In this context, I test the argument that technology and society are mutually constituted in the context of digital agriculture on the Foucauldian power/knowledge struggle, I have historicized digital agriculture; I explore the ways of its socialization. The conclusion I reached in the specific case of the agricultural society in Geyve, Foucault's argument is quite valid for this region and at this stage of history; agricultural society in Geyve is in greater need of defense, empowerment of farmers governmentality[48] in decision making, reconstruction of the farmer as a decision-maker. In order to ensure empowerment of the farmer, Fakir Baykurt (2022) claimed that a "social gyrisma" is necessary just as Foucault said that it is necessary to defend society. Baykurt mentions that "gyrisma" means agricultural preparation of soil by bringing the underlying layer to the top to improve the quality of the soil. From this point of departure, he claims that a "social gyrisma" needs to empower farmers and replace them as being suppressed to active decision makers in co-creation knowledge. In order to achieve this, the state needs to revitalize its public extension approach according to today's conditions. The state should train human resources to meet the current information needs of farmers, agricultural extension should be declared as a priority public service, farmers need be included in decision-

[48] For detailed exploration of Foucault’s concept governmentality please visit Li, T. M. (2007). Governmentality. *Anthropologica*, *49*(2), 275–281. http://www.jstor.org/stable/25605363

making mechanisms with a participatory approach, and in the fight against the climate crisis the information needs of farmers needs to be met on the basis of social development, not corporate profitability. In order for farmers to be transformed from passive subjects, who are disintegrated, fragmented, excessively individualized, become consumers of information, and loss their social memory to a great extent through planned obsolescence type of forgetting, into active decision makers, organized struggles are required instead of tactics and daily resistances. Defending society or conducting social gyrisma turns to be prerequisite for establishing the mutual relationship between technology and society.

CONCLUSION

Digital agriculture basically means the use of information and communication technologies in agricultural production systems. By ensuring the use of Internet of Things technology in food production, it is aimed to improve the relevant decisions taken and to make them data-driven. It is thought that the difficulty of feeding the world population, which is estimated to reach 9.7 billion in 2050, under stressful production conditions such as diminishing arable land, water pollution and climate change, can be alleviated with the sustainability provided by digital agriculture. The positivist paradigm that dominates agricultural communication studies prevails in all studies on digital agriculture. These technological determinist studies, adopt quantitative research methods such as the extent to which farmers adopt technology and the extent to which technology transfer is successful. This study, on the other hand, sees technology not as an autonomous factor determining social changes, not as a collection of techniques, but as a component shapes and is shaped by society. Leaning on the theoretical framework of Science and Technology Studies and arguing that society and technology are mutually constituted, I argue that this mutual relationship can be examined in the context of digital agriculture through Foucault's conceptualization of power/knowledge. To do this, I first situate digital agriculture within course of history. I attempt to understand which historical ruptures and power relations resulted in digital agriculture being highlighted as a constitutive element of sustainable agriculture today. In doing so, I utilize Foucault’s method of the history of the present. In order to treat digital agriculture as a historical, social product, I conduct a genealogical analysis, starting from the present and conduct a mapping-out to early republic of Turkey. To appropriately locate digital agriculture in the flow of history, I explain the historical experience of Turkey that gave rise to it, as well as revealing ethos of Turkey in the triangle of knowledge, technology, and society.I try to reveal through which policies, which actors, which institutions and social relations agricultural knowledge is produced, disseminated and used, and in which ways it is interrupted in the historical process that brought into existence digital agriculture, the use of big data-driven information. In order to do this, I carry out archive work of the

Ministry of Agriculture, and in order to support the documents in the archives, I conduct interviews with engineers and farmers who experienced public extension services. I also examine novels that reflect Turkey's historical experience. In this way, I argue that it is possible to indicate four main breakdowns in the socialization of agricultural knowledge: 1923-1949, 1950-1980s, 1980s-2000s, 2000s-today. While presenting a genealogical historical analysis with a history of the present approach, I also consider to capture the gray areas within the structural changes. I address how the historical breaks are experienced by farmers and how farmer-engineer encounters had emerged with concepts borrowed from the field of Cultural Studies. I utilize De Certeau's tactics and Scott's everyday resistance to explain the tension between local knowledge and scientific knowledge. In doing so, I aim to break the positivist approach in agricultural extension and communication studies and to reveal the economic, political and social references of agricultural knowledge and technology. This histroical analysis allow me to ground informed predictions for the future of socialization of agricultural knowledge.

After completing the historical analysis on the power/knowledge struggles, I focus on the present. I choose digital climate stations as digital agriculture technolgy, one of the main actors of the digital agriculture transformation in Turkey and choose Geyve as my sample, one of the most prominent agricultural production regions in Turkey. In the axis of my research questions, I attempt to understand through which power/knowledge struggles and mechanisms agricultural knowledge is socialized, how power and resistance are established, how digital agriculture and big data-driven knowledge are integrated into this form of socialization, and to what extent they contribute to sustainability. To this end, I conduct an ethnographic fieldwork in Geyve that lasts five weeks. I conduct in-depth interviews with a total of 41 interviewees, including farmers (27) and agricultural engineers (14). To enrich the interviews, I spent time at pesticide dealers and markets, make participant observations and record field notes. As I explain in detail in the relevant section, I have to apply Halloway's "Work and Talk" technique to interview with female farmers. When I finish the fieldwork, I realize that I experienced a real embodiment with Geyve. Participant observation and field notes are very useful while making the transcriptions. I notice that the lowland/mountain distinction and gender distinction are quite decisive in the socialization of agricultural knowledge. I cluster the transcriptions according to this distinction and first subject them to a qualitative data analysis program. However, the field is so multidimensional and the interviews are so intertwined with each other that coding them with a program disrupts the spirit of the field and my embodiment. The cure for this painful process is to design mind maps. Mind maps are very functional to capture the patterns in the transcripts, to show how they are connected to each other and to create a certain sequence. In order to reveal the ways in which digital agriculture and big data-driven knowledge are used, I first lay out the socialization skeleton of agricultural knowledge on which the digital cliamte stations are built. After doing this, I explain how big data is integrated and to what extent it contributes sustainability.

The first main finding of the study is that power/knowledge vary according to the form of agricultural production. In the intensive agriculture dominating the Geyve lowland, appropriatonism oriented information is dominant. The mechanisms that reinforce the power of appropriationism in the socialization of agricultural knowledge are commercialization, medicalization and patriarchization. I observe that farmers developing everyday resistance and tactics against the mechanisms reproduce appropriationism, there exists no organized resistance to structurally transform input-intensive agriculture. In the mountains, subsistence agriculture is dominant. I indicate that although the penetration of appropriationism is quite limited, it is strengthened by the mechanisms of commercialization and structural isolation. However, farmers preserve the knowledge of the mountain through the mechanism I mentioned as preserving indigenous knowledge, develop conscious strategies to limit the penetration of appropriationism and build organized resistance against intensive agriculture. In this way, a Foucauldian battle for truth takes place. However, the fact that local knowledge is not avaliable to be transffered on to the next generation, the gradual emptying of the countryside weakens this resistance and shows that appropriationism will ultimately win the battle for truth at this stage of history. Although the mechanisms are different, there is clearly a discontinuity in the socialization of agricultural knowledge in Geyve. I generate the conceptualization of "atomization of agricultural knowledge" to describe the discontinuities in the lowland. It has created a disjunction between experience and knowledge which demonstrates that information does not accumulate, knowledge is dissociated, collectivity and social memory are largely lost.

The agency of farmers in decision-making processes has been largely eroded, and the socialization of agricultural knowledge has turned a kind of non-socialization of agricultural knowledge resulting in an epistemological crisis. Yet, for the realization of the epistemological crisis on the mountain, I generate the conceptualization of "agricultural deterioration." Although certain groups continue to make decisions independently of prescriptions and the authority of commercial consultancies, they find themselves in a spiral of structural isolation, experiencing discontinuities in their agricultural knowledge and accelerating deterioration in the face of diminishing the use of indigenous knowledge with alienated generation and the increasing prevalence of approprtionism. Farmers who adhere to traditional mountain wisdom and employ agroecological practices frequently grieve the degradation they observe, asserting that preventing it is inconceivable and emphasizing the expression of "the grave after us". They claim to be capable of initiating a well-structured opposition against the power or appropriatonizm at this particular point in time, but confess their lack of power for afterwards. In this context, I argue that they are transformed into the "angel of history" in Benjamin’s terms who turns to the past in the storm and watches the wreckage of history.

The second finding of the thesis is that the epistemological and ontological assumptions of the agricultural structures assumed by digital agriculture and the agricultural structure I observed in the field are different. The social reality that digital agriculture is based on and the reality I observed in the field do not overlap. Without transforming the dominant input-intensive form of agricultural production in Geyve and without replacing it with an ecological and farmer approach that focuses on sustainability, digital agriculture has become an element that reproduces the existing distinctions and dilemmas. Digital agriculture has become a simulacrum as a signifier without a sender that has been hollowed out and rederived by the mechanisms of appropriationism. Digital agricultural stations and early warning messages have been reduced to merely images for farmers. Precise measurements have been replaced by merged crop information, and warnings have lost much of their "early" feature. For this reason, digital agriculture has not become a source of information that farmers take into account in their decision-making processes, and the goal of ensuring sustainability by reducing the use of agrochemicals in agricultural production and reducing ecological damage has not been achieved. It is not possible for digital agriculture to materialize its assumptions without fundamentally shaking the foundation of intensive agricultural structure in the field based on efficiency and profit maximization in production, in other words, without fundamentally changing the form of agricultural production and the mechanisms that constitute it.

My third finding is that the mutual construction of the relationship between technology and society, which is the main argument of the co-productivist framework of STS, is immanent to the defense of the social in Geyve. According to this approach, technology and society both embeds and is embedded in the social as such in social practices, conventions, discources, institutions. On the other hand, in the face of the power of appopriatonism and input-intensive agriculture in Geyve, the agency of farmers has been largely eroded, and they have become largely passive in decision-making processes, unable to form collectiveness, and trapped in relation of relationlessness (Jaeggi, 2014). Therefore, the relationship between technology and the social must be established starting from defending social. In order to defend society, as Foucault says, or to do social gyrisma, as Fakir Baykurt says, it is a prerequisite for farmers to be involved in decision-making mechanisms, to turn into active subjects that governs agricultural knowledge creation process establish communities that can form organized lines of resistance against power mechanisms of appropriationism that passivate farmers through the dissociation between experience and knowledge. The outlines of how the society in Geyve can be defended have emerged in the analysis of the genealogy of power/ knowledge I conduct in the context of agricultural knowledge in the previous sections. In order to create a roadmap to defend society, it is necessary to look at Turkey's historical experience of agricultural knowledge and power relations. To do this, "Comprehensive model of AKIS" proposed by Rivera et.al. (2005) on agricultural information and knowledge systems, which helped me to link digital agriculture into socialization of agricultural knowledge is utilized. This model allows me to examine agricultural knowledge process with its relation to wider economic, political and social systems which I conduct with Foucault's history of present. It also enables me to conduct an ethnographic fieldwork to analyze how agricultural knowledge is generated, extended and utilized (research, education, extension, farmers) and how digital agriculture (decision support systems) is integrated into such process within power/knowledge struggles. I also have the opportunity to analyze the extent to which digital agriculture supports sustainability. As a result, I have gained the ability to evaluate the field findings together with historical analyses and make informed predictions about the future. As a result of this evaluation, I make suggestions to start making a "social gyrisma" in terms of socialization of agricultural knowledge within the interplay of technology and society.

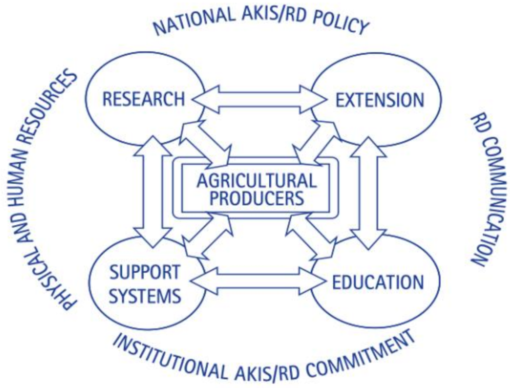


Figure Conclussion: Comprehensive model of Agricultural Knowledge and Information System
Reference: Rivera et.al. (2005)

This comprehensive model is based on empowering farmers and contributing rural development by addressing macro and micro settings of agricultural information and knowledge system together. It evaluates the establishment of social interactions by situating them in wider social and political systems. I propose my recommendations to start "defending society" or "social gyrisma" in Geyve both for macro and micro levels. With regard to policy and agricultural communication recommendations, the public extension service should be reconstituted as a public service prioritized by the state according to today's conditions. The withdrawal of the state from agricultural information processes should be recalled with a publicist approach, and public extension programs should be created to strengthen the autonomy of farmers who need more information and decision support mechanisms more than ever in the fight against the climate crisis. Many scholars (Rotz et.al., 2019; Navarro, 2016; Gliessman, 2022) indicate that inclusive extension models can also be applied, resulting from the collaboration of private advisories, private educations, NGO's, and public extension services. But the common point is that the publicity of advisory systems needs to be strengthened. In this context, an alternative would be for the state to collaborate with the private sector to advance extension programs. As I have elaborated in the related chapter, the working principles of the association of “Önder Çiftçi” which has been working to empower farmers in Turkey since the 1980s, can be examined and basin-based integrations can be ensured.

On the other hand, Turkey's historical experience reveals that agricultural extension has always been a gendered task during the period when the publicist approach was widespread to today. Historically, women have consistently had less access to knowledge compared to men. In today's conditions, the public sector extension approach that needs to be reconstructed needs to be organized in a way that does not reproduce gender-based division of labor. Women and their knowledge must be included in decision-making mechanisms in order not to reproduce the patriarchal structure, which is prone to exploiting women's labor both at home and in the field which reveals as a foundational practice is small family farming in the lowland. Moreover, the reconstructed public extension understanding should be designed in a way that does not reproduce the hierarchy and various epistemic injustice between scientific knowledge and agroecological knowledge of the past. The relationship between farmers' local knowledge and scientific knowledge should be reciprocal. The principle of reciprocity can be enhanced by utilizing local knowledge and integrating farmers into co-creation process of producing knowledge. Incorporation of local knowledge and awareness of gender is essential in reconstructing a bottom-up, farmer driven public agricultural extension program. Finally, one of the most important factors contributing to the discontinuity in agricultural knowledge today is the lack of planning of production patterns. Many of my interviewees in the field touched upon the importance of economy of scale. Within the economy of scale, basin-based production pattern planning and the appointment of engineers on a basin basis according to their educational background rather than through a centralized system contributes to prevent becoming an apprentice from being an expert in terms of agricultural knowledge and enhance communication between the farmer and the public expert to be continuous. As reciprocal communication strengthens, public extension is better designed by prioritizing the needs of farmers and applying the primary principle "farmer first" which also results in contributing to strengthening farmers agency and mitigating the epistemological crisis.

With regard to institutional commitment, human resources, according to historical analysis, the most prominent public institution that improve the reciprocity of scientific knowledge and farmer knowledge comes to the foreground as ToprakSu and its research institutes. Engineers were conducting research and development projects in terms of soil and water resources and help to deliver findings to both farmer and extension agents. Research institutes of ToprakSu need to be revitalized to the level of the General Directorate before it was connected to the Rural Services in 2004 due to today's conditions. In today's world where water is polluted and soil is lost due to the climate crisis, sustainability should be addressed by an institution such as TopraksSu through R&D projects. On the other hand, as for human resources, there are two projects related with human resources in the context of agricultural extension whose objectives have not been realized in Turkey's historical experience in 2000s entitled as KÖY-MER and TARGEL. In such projects agricultural engineers that were educated with insufficient practical training randomly and centrally assigned by the Ministry to the villages. Yet both the infrastructure was insufficient and engineers coming from city centers could not adopt rural life conditions. In other words, in these projects, grafting a city dweller agricultural engineer to the village was incompatible. In fact, there is a successful example in Turkey's historical experience of empowering the countryside and bringing farmers together with scientific knowledge. Agricultural vocational high schools, where rural children study and are trained as technicians, are institutions where practical training is a priority. Since children come from rural areas, they both know the world of farmers and learn scientific knowledge. In this way, they are trained as translators who translate science into the language of farmers and close the gap of intermediate staff. Unfortunately, in 2004, these high schools were taken away from the Ministry of Agriculture and affiliated to the Ministry of National Education, the priority of practical education ended and they lost their functionality to a great extent. The fact that the human resources that enable the farmer to make decisions are actors who know the world of the farmer and come from that world make the support mechanisms sustainable. It is important to review the current agricultural vocational high schools from this point of view in the context of today's sustainability emergency and reorganize their organizational structure.

Moreover, this model of Rivera et. al (2005) as discussed before in detail consider technology as a separate input with the title "support systems" and integrated it to the knowledge triangle of agricultural extension which are known respectively as research, extension and education. In the trajectory of agricultural change, it is a proper integration. The data ecosystem is transforming the socialization mechanisms of agricultural knowledge and driving agriculture towards a dataficiation process. Although in Geyve digital agriculture has transformed into a simulacrum due to its unique social conditions, digital agricultural technologies continue to evolve, find appropriate conditions where they can materialize their own realities. The rapid increase in ICT innovation and the hype surrounding digitalization has been transforming agricultural production. The technical possibilities provided by digital agriculture can greatly increase the sustainability of agricultural production and reduce ecological damage (Balasundram et.al.2023). For example, engineers working in agricultural companies state that they utilize of digital climate stations as decision support mechanisms, while well-educated farmers and new-peasants (Türkkan,2021) see technology as an "input" in agricultural production processes and seek to make maximum use of technical possibilities. Nedelkoska and Quintini (2018) indicate that although digital technologies allow to ease farm management with sophisticated analysis of complex data, human interpretive skills for decision making are still important. Big Data analysis can only be applied with the interpretations of the its user. Despite all attempts towards digitalization, agriculture still can't be fully automated and capitalized like other sectors. Agriculture has a unique position that has still strong connections with environmental variables and thus to a particular extent remains unpredictable. Thus, commercial farms employed agricultural engineers to extract valued information and apply Big Data statics properly. In other words, there is still a heavy reliance on the user to interpret the data. Benefiting from Big Data-driven information depends on the "digital capital" that farmers need to possess, in other words, "digital capital is deemed the new capital essential for farmers" (Saruchera, Mpunzi, 2022). Digital agricultural technology, one of the most prominent tools in the fight against the climate crisis, is driving agriculture towards a process of dataficiation (Schöenberger and Cukier, 2013). The competitive pressure of the market is realized not through agrochemicals but through data harvesting (Bronson and Sengers, 2022). It is possible to foresee that the point is that who harvests and controls farm-level data, in other words data ownership and data security will be discussed more in the agriculture of the future. For this reason, digital literacy and big data skills should be taught in both agricultural faculties and public extension services, and introductory data security, data control and open data courses should be added to the curricula of agricultural high schools and faculties. In addition to this, sociological thinking should be given a larger place in agricultural extension and communication courses of agricultural faculties and the reciprocal relationship between technology, scientific knowledge and society should be emphasised more. Most importantly, the curriculum of agricultural faculties should be reorganized to integrate agroecology and awareness of the importance of local knowledge should be raised. Also, in communication faculties courses and programmes focusing on agricultural communication needs to be integrated. Based on the historical trajectory I observe, it is my prediction that there is be a growing demand for agricultural communication specialists and a need for greater convergence of agriculture and communication disciplines.

Bronson and Sengers (2002) indicate that there is lack of scholarship about how on-farm Big Data is generated, what kind of power relations emerge within the on-farm data ownership and development and what kind of social relations that data-driven farming entails. While writing the thesis, I realized the gap that Bronson and Sengers mentioned and many new research ideas came to my mind. I hope that listing them as further research recommendations can inspire researchers to fill this gap. First of all, there is a great need of Cultural Studies discipline to address how digital agriculture is experienced by the farmer, and the process of datafication through which agriculture evolves from a sociological perspective. Also, when I was writing the thesis, I thought that it could be eye-opening to examine digital agriculture in terms of the politics of speed. The discussion of the disjunction between agricultural knowledge and experience that this thesis reveals can be re-read from the perspective of Virilio's theory of dromology. In addition, I think it would be important to study digital agriculture in terms of user experience by leaning on the discipline of Human-Computer Interaction in order to understand the relationship between technology and agricultural society. Finally, I think that addressing Foucault's concept of governmentality through datafication in agriculture enable a robust discussion of food security.

Mehmet Genç, an economic historian whose enthusiasm for research I admire says that research is at one with its researcher. According to him, when we experience this embodiment, the topic of the study flows through our minds during 24 hours as we eat, sleep or travel. One of the scholars who know Mehmet Genç well, Arif Bilgin, conceptualizes the manner Mehmet Genç describes the spirit of researcher as "fenafil (fana) ilim (science)". *Fana* means a kind of annihilation in Sufism hence it means a kind of researcher’s integration with research as a form of transcendental state. We had coffee while I was working on discussion part of the thesis. He looked at me and said "You seem to have understood what *fenafil ilim* means." I truly consider that writing a doctoral thesis was a life experience that introduced me to this kind of transcendental situation. The dust of the archive, the farmer's voice, the engineer's prescription, the veils of tomatoes, the hoeing of the weeds, the arrival of the *Erzurumlu*, the goats' ringing sound has been living inside me as I walk, have breakfast, wake up, drink coffee, do laundry, and hit the road. This journey I take to bring a social scientific perspective to agricultural communication studies has changed me too. I left traces in the field of Geyve, the field left me traces, yet the embodiment remains.

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RESUME

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