


Article

Social Capital, Trust, and Cultivation of Bioenergy Crops: Evidence from Germany and Greece

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Abstract: In the move towards bioeconomy, little is known about the contribution of factors such as social capital and trust in farmers' motivation for adopting innovative practices like the cultivation of drought-tolerant bioenergy crops. Based on the broad notion of social capital, this research investigates the level of trust in institutions, cooperation, and the cultural value of farming in Greece and in Germany. Focus group discussions and interviews with farmers show similar levels of trust in institutions in both countries. Trust in cooperation positively related to community social cohesion in Germany, in contrast to the predominant mistrust of formal and informal forms of cooperation in Greece. In Germany, the cultural value of farming, urban "demands" impeding traditional small-scale farming, and their primary role in producing and guarding the rural environment tend to hinder the adoption of bioenergy crop cultivations. In Greece, the marginalization of farming results in an uncertain/ambiguous farming self-concept and, in turn, to an easier adoption of innovations such as the cultivation of bioenergy crops. All three dimensions are pivotal in agriculture, rural development, and energy transition, as they affect how people relate to institutions and to each other and organize and perceive themselves in the current representations of rurality.

Keywords: bioenergy crops; farmers' perceptions; social capital; trust; Greece; Germany



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1. Introduction

The cultivation of bio-energy crops or biomass-based biofuels has been addressed as a cornerstone solution to contemporary and highly pressing global challenges. These include the sustainability of the transport sector, political concerns over energy security, and the commitment of the European Union (EU) to reducing carbon emission to combat climate change. Moreover, the 2030 Agenda for Sustainable Development Goals [1] prioritizes food production (Sustainable Development Goal 12, SDG 12) and energy security, and urges societies to opt for energy from renewables, i.e., non-exhaustible sources, including biomass fuel (SDG 7). In this constant task of energy transition (moving to alternative energy sources that produce less carbon dioxide) [2], biomass from long established sources, in marginal lands and agricultural residues, remains a competitive resource, and the least contentious politically and environmentally [3–5]. However, innovation adoption like the cultivation of bioenergy crops can have a range of unintended consequences, including economic, environmental, and land-use conflict risks, as well as conflicts with social values [6–10].

The economic impact of bioenergy crops on agriculture and food production, its link to legislative and policy problems on the transnational European level and to issues of mitigating climate change, and fostering rural development plans [11–13] have given rise to heightened research interest in country differences over the adoption of energy crops cultivation within Europe [6,10,11,14–22].

Given the essential role of farmers in the adoption of new and innovative agricultural technologies and strategies, research has addressed various factors that may motivate or deter them from cultivating drought tolerance energy crops. Scholars empirically analyzed the impact of demographic factors, educational level, social concepts and economic status,

institutional and political factors [6–9,23] and farmers' perceptions of risks/costs and benefits on their willingness to adopt bioenergy crop practices and technology [7,8,23,24]. Other studies have further shown that the natural environment, land types, local landscape, and biodiversity, as external factors, represent key factors affecting the adoption of biomass technology by farmers [6,9,10,19,22].

Yet, existing research has paid limited attention to the impact of socio-cultural factors, namely values, social networks, social trust, norms, etc., in the bioenergy transition [10,24–26] and, to the best of our knowledge, even less to the potential role of social capital on the adoption of drought tolerance bio-energy crop cultivation by farmers. In other words, human factors, individual relations, and socio-cultural values and their potential influence on farmers' motivation to cultivate drought tolerance bio-energy crops have not received the necessary attention. Nevertheless, the social capital concept emphasizes the nature and role of relationships and their key role as hidden resources in various aspects of life–work, family, and community [27], promoting communication and collaboration among individuals, stakeholders, and communities. Similarly, uncovering social capital's direction and degree of influence on farmers' adoption of new agricultural technology may inform policy making and implementation towards energy transition.

Arguably, social capital tends to be operationally defined and measured mainly at state or country level [28,29], while research focusing on the accumulation of social capital and its different components at individual farmer level is scarce [30,31]. Even less research focuses on social capital in agricultural development and energy transition processes. This paper aims to contribute to the relevant literature and research by employing a differentiated understanding of social capital focusing on its different attributes, i.e., social trust, cooperation, and the cultural value of farming in the adoption of drought tolerance bioenergy crop cultivation by farmers. The related analyses are based on two case studies in two different European countries, namely Germany and Greece.

The Interplay of Social Capital and Trust in Rural Areas

Social capital is, nowadays, a widely used concept [31–41]. It refers to relations of trust and cooperation and networks and organization that can promote co-operative actions [28] (p. 167) and [42–44]. Specifically, social capital can be detected through trustworthy relationships that can provide the basis for formulation of networks. These, in turn, can foster rural development processes [28,37]. The key feature of this relational dimension of social capital is trust [28,34]. In this study, trust is used as a proxy not only of social capital, but also of participation in different forms and levels of cooperation (i.e., neighborhood meetings to resolve conflicts, members of a cooperative that can rely on each other, etc.). Fukuyama [34], in particular, practically equated social capital with trust and argued that social capital can be defined simply as the existence of a certain set of cultural values or traditions shared among members of a group that permits cooperation among them. As explained by Wilson, social capital (or trust) includes the benefits or advantages resulting from “one person or group's sense of obligation towards another” [37]. Within this framework, the role of trust is an important driver, a precondition, and an outcome of social capital, and is evident in line of research in (local) development within rural areas [31,40,41,45,46].

Overall, it can be argued that social capital is considered a development tool for society, state, institutions, networks, and organizations. It refers to the complementary norms, values, attitudes, and beliefs that govern interactions among people and institutions and predispose them to cooperation and mutual assistance [27,28,35]. It builds the trust that forms the basis of flourishing innovation adoption or business relationships, as well as reinforcing social norms. Trust and the reinforcement of social norms enable innovation adoption to flourish [33].

Nevertheless, the relevance of social capital in the ability of rural communities to manage and respond to the economic, social, and environmental pressures in an attempt to guarantee sustainable development goals and transitions has been acknowledged in

the literature [9,19,26,33,40,41]. For example, empirical research has shown that rural communities endowed with a rich stock of social capital (social networks and norms and values associated with social relationships) are in a better position to resolve disputes, share useful information, and implement successful global and rural development challenges [42].

Putnam's [29] contention that social capital is expressed in the links that people have with each other and in the sharing of common interests is particularly relevant to the rural sector, since farmers tend to have a common history and shared life experiences from which they built relationships and generate knowledge [43]. Adding to the above social capital's elements such as obligations, expectations, channels of information, and social values, it becomes apparent that these notions can be fruitful, as they focus attention on how socio-cultural and economic actions are stimulated by the nature and quality of the interactions of farmers within the networks they partake. In this sense, it can be viewed as an important resource attached to farmers themselves in adopting innovative agricultural technologies/practices, such as the cultivation of bio-energy crops.

Several authors [25,47–51], have emphasized the interplay of social capital with other elements such as endogenous growth, social innovation, institutional arrangements, production and distribution, sustainability and energy transition in integrated rural development strategies. Koutsou et al. [45] measured different attributes of social capital, such as trust in people and institutions, in order to identify different levels of social and technical innovation between farmers. They argued that the majority of farmers struggle to find new ways to improve their performance and generate new opportunities for farm livelihoods only by undertaking common actions within the social economy for common solidarity goals within trustworthy networks. The case-studies of Field [47], Peters and Sawicka [49], and Peter et al. [50] focus on the role that rural areas and agriculture can play in the transition towards a low-carbon, resource-efficient economy. The social capital dimension is, in these cases, expressed in cross-sectoral management, new territorial-level arrangements, new forms of governance, and the valorization of different kinds of knowledge, always in terms of rural development strategies and livelihoods [25,42,51].

However, and despite its importance over time and even today, the concept of social capital is a multifaceted phenomenon that cannot be captured by one single definition or any single measure regarding rural communities [52]. In a similar vein, rural communities are not homogeneous. They are comprised of different statuses, classes, values, and other circumstances that may hinder social capital, since they often experience tensions and conflicts that are difficult to overcome in transition economies, cf. [31,53–55]. In this respect, a more differentiated account of social capital is needed, since rural communities are heterogeneous on the one hand and social capital on the other is difficult to apply, build and maintain [28,31,54].

This approach is valuable for the consideration of farming and farmers' networks because it allows a focus on forms of capital beyond economic parameters. It provides a clear way to understand instances of farmers' interactions and cooperation—not exclusively in the institutional sense—and wider sets of interchanges, and how these evolve or evolved over time. In this respect, we may arguably consider whether formal or informal forms of farmers' collaboration function as a means towards the adoption or not of bioenergy crops.

The importance of these themes has been exemplified in broader studies of agricultural activities. Both Putnam [28] and Fukuyama [34] highlight the importance of cooperation in rural development policies from the perspective of "social capital", since cooperation emerges as a result of trust between individuals. In this sense, social capital is linked to the quality of the existing cooperative environment at the local level, and has a significant influence on the adoption of bioenergy crop initiatives in rural areas and, ultimately, on the sustainability of rural communities where farmers are key residents [26].

Therefore, in agriculture, trust is, in many ways, a form of social capital interlinked with various factors associated with innovation adoption and sustainability. According to Han et al. [56], for example, in rural China, the process of informal cooperation was found to be facilitated by the presence of social capital, and was associated with higher

levels of trust within the community in specific regions. On the other hand, remoteness and the closed character of rural areas were associated with higher levels of social capital [57]. Positing that trust is a precondition and an outcome of social capital, Rivera et al. [31] and Chamola et al. [46] demonstrated that, in the presence of trust, co-operation among farmers and participation in a producer company is facilitated, is sustainable, and simultaneously positively influences local governance and outcomes in rural areas. Similarly, Ezezika et al. [58] report that the successful partnership of agricultural biotechnology in Burkina Faso depended on strong collaboration between research, industry, and farmers, fostered by trust. The significance of collaboration and networking as a form of social capital is further evidenced in examples such as the reduction of contracting costs and increased efficiency via trustworthy relations in rural agro-enterprises in Colombia [59], on local development among Local Action Groups in Italy (Nardone et al. [60]), farmers' innovation adoption in China [61], the sustainability of producers' company in India [46], the de-risking innovation adoption among Ghana cocoa farmers [62], and even a positive element in interorganizational cooperation [63] and revitalization of farmers' homestead [64]. In contrast, Kasabov [65] turns to issues of trust, mistrust, and trustworthiness among members of Welsh rural cooperatives in order to explain failures in performance. On the other hand, Curry [66], drawing on an English case study, highlighted the importance of personal trust in rural decision making and the improvement of rural public domain decisions. According to Bosworth [67], these higher levels of trust in rural areas by taking into account the fact that at local level entrepreneurs are closer and highly committed to their community. They exhibit a great sense of belonging to the place of origin, and have social and professional ties rooted in reciprocity and trust.

The role of institutional trust as an explanatory variable of social capital in rural areas has also been discussed in the rural studies literature, again as a proxy of social capital that contributes to different levels of local development [68,69]. Do Carmo [70] states that it is rather difficult to identify values, trust and other social dynamics in isolated rural villages that are really building up their capacity to generate forms of social capital. In their study, Charatsari et al. [71] provide evidence that the cultivation of social capital and social connection among farmer field schools participants promotes the participatory development of innovation and fosters knowledge by farmers. Trust in local entities and government institutions has been explored as a prerequisite in rural communities in the process of innovation adoption, and as a crucial factor in the success of the implementation of rural development initiatives [30,31,54]. In this context, other authors [68,72,73] examined the role of trust in people and in different levels of government as an explanatory variable of agricultural success in Central and Eastern Europe, Korea, and China, respectively.

Evident from the above is that social capital is a key factor in agriculture and, specifically, in innovation adoption technology in rural areas (e.g., drought tolerance biomass crops), as it affects farmers' decisions/perceptions and how they relate to each other and organize themselves. In addition, there are different understandings of what social capital means in practical terms, and this implies different views on whether and how social capital can be 'built' or enhanced. However, few attributes tend to be more often connected with social capital. These are trust in institutions, cooperation, and the cultural value of farming [31,41,45,72].

In this paper, we explore how social capital materializes in the context of farmers' decisions to adopt drought tolerance biomass crop cultivation. In the analysis and discussion, we pay particular attention to trust (institutional) cooperation, and the cultural value of farming, since these attributes tend to be more often connected with social capital. We will examine how they emerge, unfold, and interact in different situations.

2. Data and Methodology

The research reported in this article took place in the context of project WATBIO (<https://cordis.europa.eu/project/id/311929>, accessed on 18 January 2024), which generally aimed to develop improved biomass crops suited to water-stressed environments in Europe.

Part of the project was to investigate the farmers' willingness to cultivate these plants [74]. In this article, we report partial results focusing on how social capital materializes in the contexts of farmers' decisions to adopt drought-tolerant biomass crop cultivation in two of the countries involved, namely Greece and Germany. The two countries were selected for comparison because of their differences in size and use of land, as well as organization of farming (e.g., more family-centered, small size farming in Greece, larger size, enterprise-oriented farming in Germany).

Moreover, we opted for a qualitative case-study approach, and we employed focus group discussions and personal interviews. Such approaches allow the particularities and complexities of local meanings to be fully explored, recognized, and embraced [75], as they have significant potential to grapple with the multiple and context-dependent values, judgements and subjectivities involved in the formation of perceptions and overall decision-making. To accommodate for research location specificities and research resources, a focus group discussion was held in Greece and phone interviews in Germany. The study was approved by the Research Ethics Committee of the University of Crete.

The Greek sample ($n = 15$) comprised 12 active farmers and livestock farmers, one representative from a local environmental protection NGO, one representative of the industrial sector that uses bioenergy crops to produce energy, and one biofuels policy expert. In this paper, we focus exclusively on farmers' accounts ($n = 12$). Key informants were used for the identification of potential participants. The time and place of the meeting was arranged so that the needs and preferences of participants were accommodated. A discussion guide including nine main discussion themes, as well as additional discussion probes, was prepared ahead of time. The discussion was facilitated by a moderator, and took place in March 2014.

The discussion evolved in a spiral-like fashion. Participants were first asked to talk about various aspects of agriculture that they felt important and meaningful to them, as well as any concerns that they had about the area they live in. The topic of bioenergy crops was only introduced late in the conversation, and revolved on issues of bio-energy crops in general, their economic and ecological advantages and disadvantages in production and distribution arrangements, participants' relations with other stakeholders apart from farmers, such as consumers NGOs and institutions, etc., their appreciation of food and nature, their perceptions of farming as an occupation, etc.

In Germany, a total of ten phone interviews were conducted. Phone interviews were selected in Germany, primarily for reasons of cost and effort efficiency. Given the framework of the specific project, it was not possible to organize focus groups on site. Additionally, given the controversy surrounding biofuels in Germany, it was decided that personal interviews will allow the various stakeholders involved to express themselves more freely. The interviews took place between May and June 2016. A shorter time gap between focus groups and interviews would have been preferable. Nevertheless, we believe that this gap does not impact on research findings, given that significant events concerning biofuel crops did not occur in between. Interviews covered a wide range of stakeholders: NGO specialists, policy makers (government and associations), and conventional, organic, and biomass farmers. Again, in this paper, we focus exclusively on farmers' accounts ($n = 5$).

A semi-structured questionnaire covering similar issues to the ones addressed in the focus group discussion was prepared ahead of time and adjusted to the study population. The interview guide was prepared as close to the focus group discussion guide as possible, thus allowing closer comparisons between themes. Similar to the focus group, recruitment strategies were implemented.

The data were evaluated using thematic analysis, a tool appropriate for identifying and reporting qualitative data themes [76]. Moreover, focus group and interviews were analyzed with reference to the impact of trust, co-operation, the cultural value of farming, and the connection of these attributes to farmers' perception towards the implementation of drought tolerance energy crops policies.

3. Findings and Discussion

Based on our two case-studies, in this section, we shall explore how social capital materializes in different cross-cultural settings, in terms of trust in institutions, cooperation, and the cultural value of farming in support of farmers' perceptions towards the adoption of bioenergy crops. Cross-cultural settings are in a constant flux. For example, in Germany, trust in government has decreased over recent decades [25,49,77]. In Greece, due to the economic crisis and the accompanied severe austerity measures, trust in government and general institutions has further decreased, cf. [69,78]. Moreover, representations of rurality, and specifically farming, differ strongly between the two countries. In Germany, farming is usually associated with land ownership, land management, and environmental preservation [25,77], while in Greece with individualism and a need for modernization [45]. For farmers, traditional farming holds a peculiar economic, cultural, and symbolic value, and this may interact with other aspects of their lived experience in unique ways that provide them with economic stability. However, the current representations of rurality and specifically of farming (i.e., mix of production, consumption, and conservation values) alienate farmers from their primary role of producing and guarding the rural environment. This same fact may also inhibit innovation and new ideas that require doing things differently. When traditional farming values are contested with new practices, such as the adoption and cultivation of bioenergy crops, these can create resistance to change and, therefore, hinder innovation. In combination with the decline in institutional trust in both Germany and Greece, this could be accompanied by a decreasing tolerance of innovation-adoption ambiguity/uncertainty. On the other hand, this could also lead to an increase reliance or willingness to develop or rely on peer-to-peer groups/cooperative relations [57].

3.1. Farmers' Lack of Trust in Government and Institutions

Social capital refers to relationships, and trust is an important feature of it [79]. Social or interpersonal trust concerns trust between individuals, while trust in institutions is defined as confidence in state organizations, regulatory bodies, and non-state organizations. Trust in people and institutions is a factor in determining the quality of society, and is a powerful indicator of well-being both at individual and societal level. According to Luhmann [80], trust increases the tolerance of ambiguity and opens up new possibilities for action, while 'trusting' on the micro/macro-level means expecting a 'good' performance between actors at and across different scales, despite an inability to control, enforce, or monitor that performance, even though there may be reason to suspect an intentional or careless violation of one's expectations [79] (p. 412). However, Hooghe and Marien [81] argue that governments and regulatory institutions realize their capacity to generate trust only if citizens consider the state and its institutions to be trustworthy themselves. According to Giddens [82] (p. 83), trust in "expert systems" is a ubiquitous requirement of modern societies, and it is particularly tricky for innovative technologies because the expectation of future performance of the relevant institutions and actors cannot be based on prior experiences. In the absence of personal experience and lacking expertise, lay people rely on information provided by science, politics, regulatory bodies, industry, environmental and consumer organization in their evaluation of innovative technologies. In addition, and in order to facilitate smooth collaborations, nourishing trust is fundamental at each stage of the creation and evolution of these expert institutions.

This may explain why the transition to biomass energy strategies through the adoption of drought tolerance bioenergy cultivations is construed as complex and sometimes incongruent with farmer's farming identity and management, whose basic objective was to produce food leading to low levels of trust "... how can I possibly trust the government when they have installed solar panels in high fertile meadows!!!!" [Farmer (iv), Greece]. Farmers, in the absence of personal experience, seek trustworthiness in innovation technologies from state and regulatory institutions as a source of information and trust. However, institutions fail to provide factual information due to lack on prior experiences and coordination, leading to disappointment and high levels of mistrust [83].

“... but there is no plan from the government. No plan for energy distribution or production, nothing... and we farmers need a future perspective, we need planning, security... something certain that will allow us to make calculations and plan...” [Farmer (a) Germany]. “...that is why we stopped the biomass because we didn’t have anyone to rely on...”. [Farmer (d), Germany]

Such opinions were not merely confined to the German case-study, but also applied to the Greek case-study, where low levels of trust towards the government and the general political system are significantly expressed: “... *everything goes in Greece. There is no planning, no control, no safeguarding, no seriousness, no responsibility* ...” [Farmer (iii), Greece]. Moreover, some interviewees expressed sentiments of distrust towards the EU agricultural policies and regulations.

“... I don’t even trust the EU... some decades ago they subsidized us to increase food production, then they subsidized us to decrease production and now they want us to cultivate bio-energy crops instead of food... I think its role is suspicious, very suspect...”. [Farmer (v), Greece]

Or

“... the reliability of the support offered through policy, this must be a given, and at the moment is not the case... reliability is the alpha and the omega for us ...”. [Farmer (b), Germany]

In addition, another farmer (farmer e) from Germany, perceived EU policies and regulations as an endless process with binding conditions to their profession: “... *farmers are always being decried... because they think we [farmers] are not doing anything good and they have to keep a close watch on these things reducing our ability to act and make decisions...*”. The specific interviewee associated the cultivation of bioenergy crops with EU policy makers who “*don’t necessarily have any knowledge of local needs and affairs... thus their support to this innovation is unreliable...*”. Elsewhere in the interview, he discussed the close, iterative relationship between the state, the EU and those who work for these institutions, stressing his belief that “*they claim to support and value agriculture, but the trend is towards the larger players (large farmers/farms) that is why they forbid certain things [i.e., support small-scale farmers] ... just because of lobbying!*” Thus, for farmer (e), bioenergy crops is not an innovation to be implemented for the advancement of energy transition and rural development, but “*to create a different image of agriculture for the media and the consumers who demand higher standards from us...*”.

Other participants from the Greek focus group were also skeptical towards the adoption of bioenergy crop cultivations due, in part, to an explicit recognition that corruption, fraud and discrimination are inherent in the current political system. Reimer [82] emphasized that lower levels of trust can be expected in relations characterized by asymmetrical levels of knowledge and power. For instance, farmer (iv) (Greece) pondered the way in which government entities and political institutions promoted schemes of general protectionism during the last decades, which are to blame for the decline of established collective actions such as agricultural co-operatives.

“... the “system” has its own way because it is corrupt. It does not care about the weak but only supports the strong ones. Our politicians are venal... I have lived through all this and I don’t want to hear anything about co-ops. Because I know that sooner or later, a conman or a politician will slip in, and he will corrupt it”. [Farmer (iv), Greece]

Information on social capital, such as mistrust towards state and EU institutions, and mistrust in private bodies and collective management, disables the implementation of initiatives, policies, and innovations (e.g., *bioenergy crops*, emphasis added) in rural areas [53]. In contrast, and according to Nooteboom [84], when institutional trust is limited, people tend to turn to private institutions and personalized relationships. However, Hooghe and Stolle [85] argue that mistrust towards government entities prevents the development

of trust in the private sector and of course on other citizens. . . . “[T]ruly I can’t really predict what these people [environmental protection parties and agencies] would like us to do. I think they’d prefer that we go back to farming with horse-drawn wagons!” [Farmer (a), Germany].

Trust in institutions, in general, is an invaluable asset for innovation adoption technologies such as the cultivation of bioenergy crops, as illustrated in both case-studies. A significant difference between the two cases is that trust according to the German respondents is bound to specific institutions and actors, while Greek respondents express a general mistrust to government and transnational institutions such as the EU.

3.2. Germany: The Importance of Cooperation

Trust is a precondition for strong social capital, and it is defined as the belief in the reliability and the ability of someone to create strong interpersonal relationships in the public and private spheres which, in turn, promotes collaboration and cooperation [29]. Although this work does not focus specifically on cooperation—or at least cooperatives in the institutional sense—it is important to consider how enhancing relational trust between farmers and/or organization affects the adoption of innovation technology. Bourdieu’s [32] depiction of capital exchange provides a fruitful way to explore how farmers interact. In particular, it provides a clear way to understand not just specific instances of cooperation, but wider sets of interchanges and how these evolve(d) over time. The existence of co-operative initiatives and farming relations has surfaced as an important factor that could influence farmers’ decision-making, since cooperation is viewed by many as a means to share responsibilities, complement, help, participate, and negotiate. It is about maximizing strengths, making better use of opportunities, and better protecting against threats. In their discussion of farmers’ interactions, Huang and Drescher suggest that “land managers who trust and have confidence in each other will probably work effectively in all levels and thus will require less input to foster collective action” [86], (p.1351).

One important observation regarding the German case-study is that co-operation and farming relations are shaped by informal cooperation, cf. [87]. The relational dimension of social capital describes the type of personal relations farmers have built up between them through a number of interactions:

“... we also consult and give advice to one another, because we’re all running agricultural businesses and we can share our experiences regularly ... Also, we exchange among people; we talk to one another, people have a common economic interest in supporting their neighborhood with regard to the social components of creating infrastructure, saving costs, and particularly for instance with regard to preschools, schools, churches and the like ...”. [Farmer (e), Germany]

The key attributes of the above relational dimension include, although not explicitly stated, trust, trustworthiness [28,34], and reciprocity [35]. These informal relationships have a positive impact on relational capital, but also on the community, as they improve wider co-operation and farmers’ reliability on their own resources. Interestingly enough, as seen above, some interviewees added a community-level trust reinforcing local development. Informal co-operation between farmers was built up here through direct exchange and experience, and facilitated through more issue-centered trust.

3.3. Greece: Individualism Reinforcing Lack of Trust and Co-Operation

The Greek case study illustrates that the sharing of common interests and objectives is not always enough to achieve trust-based cooperation, cf. [45]. Socio-cultural, historical, and political factors also play a very important role, at least in the case of Greece, with declining levels of political participation substituted by higher levels of individualism and very low levels of social trust and disbelief in political institutions, which portray very low levels of social capital [78]. This has led to a lack of social skills and trust among farmers restricting, at the same time, all types of networking and collaboration to achieve mutual goals. This generalized situation of individualism among Greek farmers inevitably

leads to a weakening of social capital, ultimately hindering the adoption of innovative technologies [45,69].

The following extracts make a clear reference to different forms of weak social capital stemming from individualism, but on the other hand, to a strong, although implicit, ‘desire’ to form different levels of cooperative activities starting at the informal farmer relations level:

“... and it is because of individualism that we have all these disagreements and a general deficit and lack of interest in community life engagement ... cooperation and overall engagement with social reality ... well all these are missing in our villages.”. [Farmer (vii), Greece]

Farmer (vii)’s conscious recognition that lack of cooperation and trustful relationships are negatively perceived indicates an acknowledgement that individualism has apparently deepened rural qualities. Similarly, another farmer commented:

“... individualism holds very strong and that’s the reason we have difficulties in establishing trustful relationships. Everyone undermines the other one. ...because there is a relational deficit. ... people are not interested to get involved in a common cause or to support social issues”. [Farmer (viii), Greece]

Individualism, as expressed in the above extract, is a preference for being and working in isolation, but it also dissuades other co-farmers from making new and innovative investments in farming:

“... [Where we live] is quite isolated. There is no comparison (with other places) where quite a few industries are in place. Here, in our area, we need to set up a food distribution network, or something similar that enhances the agricultural sector, otherwise we won’t survive ... and I am one of the very few who supports such an idea but I have no support from anyone else. ... and not only that ... some of my co-villagers hold me back from such ventures. ...”. [Farmer (ii), Greece]

The assumption here is not that individualism increases the level of trust, but it implicitly increases its relevance for decision-making and attitude formation regarding new forms of co-operation and, consequently, innovation adoption technology. The Greek case-study illustrates that the experience of co-operatives in the past, has led to a lack of social skills and trust, and that trust needs to be gradually rebuilt and nurtured. Furthermore, the above quote echoes an ‘implicit’ desire for cooperation by picking up the deeper sets of farming relations, which underpin farmers’ collective disposition and those specifically relating to the uncertainty in adopting drought tolerance bio-energy crops.

Building trust, therefore, is key for these exchanges to happen successfully and sustainably. The rebuilding of trust also concerns the relations between farmers, processors, retailers, and consumers [69].

“... all these [bioenergy cultivation] should be undertaken collectively, through a cooperative for example ... so we know how it works, where to distribute and at what price so we can be competitive not only here but also abroad ...”. [Farmer (x), Greece]

While social capital and trust, according to Putman [29], mean that members of, for example, a cooperative, and/or distributors, processors, etc., can rely on each, farmers are reluctant to formally co-operate, as illustrated at the following quote:

“... personally, I had a couple of bad experiences with these sorts of companies; the same applies to the merchants. We need to find a way to bind somebody who wants to purchase our products, into meeting the money part of the deal, instead of them issuing uncovered personal cheques! I have lost a lot of euros through these bad transactions. ... I have lost my trust”. [Farmer (vi), Greece]

The sharing of common interests and objectives is bound to historical factors, and values are not enough to achieve any type of cooperation in the Greek case-study, since

mistrust in collective management is very profound. The priority of Greek farmers is to keep personal control over their work and its organization. This very individualistic attitude means that, sometimes, they have less possibilities for joint investments, as well as less chances to benefit from common ideas and joint projects for their development.

At the same time, it is clear that this “... *lack of interest and trust for cooperation and cooperatives is the result of the overall crisis in our system. . . State and institutions do not favor bottom-up planning and social engagement. . .*” [Farmer (x), Greece].

A historical ‘devaluation’ of farming and farming cooperation, which prizes agricultural policies, state intervention and institutions that were mostly intermittent, unreliable, and unsupportive to rural populations, rather than being continuous, stimulating and promoting local collectivities led to a gradual degradation of farmers cooperation and thus weak social capital.

3.4. Culture and the Value of Farming

Culture and values are deeply embedded and transcend across all dimensions of social capital. Accounting for the emergence and significance of how farmers value their occupation is an important foundation for the design of the adoption of biomass crop practices that are workable, not only in economic terms, but social and cultural elements that are highly meaningful to people in their everyday lives and practices [6,10]. In this respect, the value of farming plays a crucial role in the development of new activities, since they may contribute significantly to the success of initiatives or policies and the improvement of their impact. Culture can also be a key factor in social cohesion, and in fostering a sense of community and self-esteem. This means that farmers do not evaluate their occupation based on objective criteria, but encounter farming through their own identities, their accumulated life experiences and in terms of the social, political, and economic processes in which they are already embedded. A strong cultural value of farming serves as a cohesive force and fosters collective self-esteem and, thus, social capital.

3.4.1. Germany and the Value of Farming: Them against Us

The German case-study shows that the value of farming is guided by an emphasis on the consumption of rural places by individuals who live in urban areas, cf. [88].

“...society is in the cities so to speak, and they tell us what we, in the countryside, should be doing, even though they often don’t know the context or factors at play ...”. [Farmer (e), Germany]

In this respect, the value of farming affects how farmers perceive their occupation, particularly, the way farmers are viewed by urban consumers “... *they fear that what we are doing is not right, that it’s all wrong or that it leads to some damage of some kind . . .*” [Farmer (e), Germany]. Urban concerns have, however, dominated rural places, and frequently assigned many new demands on the countryside [89]. In some instances, the urban–rural ‘binomial’ can direct/guide the type of farming or entrepreneurship that can or cannot be pursued [88]. This is clearly illustrated in the words of this farmer: “... *we’ve adjusted to what consumers in big cities want and when they demand that we change the way we do things*” [Farmer (f), Germany]. Urban concerns also assign a more marginal role to farmers, and can even impede someone becoming a farmer: “... *it is not that people are moving into the cities, in our area people are giving up farming activities. . .*” [Farmer (g), Germany]. In Germany, farmers express cautious consideration towards the tendency of a dominating farming business because “*nowadays agriculture is not practiced as much by families but rather by companies*”!!! [Farmer (f), Germany].

Another issue associated with the change in the farming business model is that ownership of the farm is moving away from the local community, as farm consolidations are increasingly taking place:

“...because nowadays farmers and thus farming as an occupation can only survive and thrive by taking over other farms, and so, it’s a question of whether

someone does this from the same location or whether it's someone who is not a farmer and not from that area at all but instead comes from somewhere else entirely . . . and is not rooted to that area or community at all. . .". [Farmer (c), Germany]

For farmers in Germany, traditional farming holds a particular economic, cultural, and symbolic value, and this may interact with other aspects of their lived experience in unique ways that provide them with economic stability. However, the current representations of rurality (i.e., mix of production, consumption, and conservation values) alienate farmers from their primary role in producing and guarding the rural environment. This same fact may also inhibit innovation and new ideas that require doing things differently. When traditional farming values are contested with new practices, such as the adoption and cultivation of bioenergy crops, these can create resistance to change and, therefore, hinder innovation [90,91].

3.4.2. Greece and the Value of Farming: Marginalization/Devaluation of Farming and Self-Identity, Pessimism

In Greece, some of the key events pointed out by focus group respondents have shaped, to a greater or lesser extent, the way they value/perceive farming. Phenomena beyond the realm of the individual farmer, but relevant to the monetarization of farmers' land, may have negatively affected their culture, tradition, and values of farming as an occupation and way of life. It was seen elsewhere [91–93] that changes to agricultural policy and governance, external markets, and weak succession cycles reflect pessimistic beliefs concerning the farming sector in European countries. In this respect, the decreasing proportion of farmers, particularly those of younger age in Europe, is seen as a problem due to the perceived loss of potential in creating efficient, competitive, innovative, and therefore more profitable and sustainable farm businesses. This suggests that, even when farmers are highly motivated, economic conditions that negatively affect the farming sector can reinforce the decision to remain inert towards the adoption of innovative technologies [94]. Focusing on the economic dimension one of the farmer's was pessimistic about farming as a viable career path:

"... If someone can earn a salary of even less than 1000 Euro per month working for the public sector they leave to become public servants ... this is the only justified in our conscience viable sector". [Farmer (i), Greece]

Another farmer, sixty years of age, also thought that farming is not as prestigious as an occupation in the service sector, and claimed that "*those who left farming were right to do so*" [Farmer (viii), Greece]. This strong sense of devaluation/marginalization of farming as an occupation has often been ignored in the literature [95–98].

Income was clearly related with the intention to continue farming. On the other hand, negative factors such as urban expansion and lucrative job opportunities in urban areas reinforced pessimism regarding the culture and value of farming in Greece, and were linked with farmers' intention to quit farming [95,96].

Self-identity and evaluation of self-worth, heavily influenced by an individual's occupation [99] and actions, for farmers were linked to the way they value farming [100,101]. As one of the participants in the Greek focus group stated:

"... I personally regret staying here and not leaving [to a larger city] ... after working for so many years on the farm, I have reached this point of total despair. . .". [Farmer (vi), Greece]

This negative statement may be derived from skepticism about the adequacy of the economic conditions of farming that reinforces farmers' pessimism about the farming sector. Greek farmers' productive values and negative self-identity and self-evaluation hinder their navigation towards other post-productive identities, cf. [89]. Post-productive and productive values could not co-exist because "*even when people engage in farming, they do so*

only to get occupied. They don't take charge, they don't have the willpower, the determination to go a step further..." [Farmer (ix), Greece].

Farmers of the Greek focus group consistently and frequently used words including *stupid*, *despair*, and *inferiority complex* to describe themselves, how they compare themselves to others, and how they perceived that others (society at large) see them [99,100].

"... well... I think it is the way we [farmers] are made. I don't want to think, I can't allow myself to think about it. I can say that I include myself among the stupid ones..." [Farmer (ii), Greece]

The above statements only perpetuate a sense of the farmers' marginalization, stereotypes, crisis of self-identity, low self-esteem, and social exclusion. In turn, these lead to aspects of occupational isolation and aspects of fatalism, as seen from the extracts above. Moreover, this trend limits any desirable trait for co-operation or innovation adoption technologies:

"... in our village, we are dealing with people who have no energy for co-operation, for anything. Whether this is social activities, no willpower for any kind of action... no audacity, no bravery, no trust, nothing; farmers remained in the fields because they had nothing better to do, and they could not run away. Just remain there underemployed without any courage to do something more..." [Farmer (iii), Greece]

A common narrative of ruralities that did not follow the Western development path, at least in Murdoch et al.'s [90] terms, is its modernization need, associating the countryside with a notion of 'backwardness' [102], lagging technologically and culturally. In this context, research reveals that rural areas demonstrate highly diverse experiences regarding the financial crisis, with some areas witnessing inequitable distribution of desirable resources such as land on the one hand, and young farmers' marginalization on the other [97,103].

Furthermore, the consequences of lack of trust, notions of fatalism, isolation and exclusion have created tensions between retired and younger farmers. These two age groups act in a property-centric manner. The observations on land management in the following two extracts are important for our understanding on the culture and value of farming as an occupation and our specific consideration of bio-energy crops.

"... I think that older people until the end of their lives remain (persistently) in charge of the farm business because of subsidies 'preventing' us [the younger ones] from taking charge of farming..." [Farmer (xi), Greece]

From a different perspective, young rural people who may want to become or remain farmers struggle to access land [98].

"... a retired farmer could get rent for his land and [even] earn more than if he cultivated a specific crop and I could get what I want [the land needed] to produce for a living..." [Farmer (xi), Greece]

Land kept by old/retired farmers because of subsidies becomes the central factor in the marginalization of young farmers. Regarding ageing farmers' incentives, several studies have found that the decrease in the number of young farmers has been influenced by ageing farmers' unwillingness to pass the farm to new generations, due to educational, financial, and motivational reasons [87,97,98].

Such 'negativities' relating to land rental opportunities may provide both structural as well as social barriers to both age groups, thus resulting in unsuccessful attempts to work collaboratively in the land management domain. Structurally, the cultivation of subsidized bioenergy crops from retired farmers, according to the Greek case-study, may leave pockets of land unmanaged in environmentally optimal ways, thus threatening the biodiversity of the area. This, in turn, may create social problems alluded to in the extract mentioned above, where a lack of land for rent may hinder the sustainability and livelihood of young farmers (i.e., unemployment, rural outmigration), obstructing social cohesion and social capital.

4. Conclusions

In this study, we explored how social capital and trust materializes in the context of the adoption of new technologies such as the cultivation of bioenergy crops in rural areas. The cases of Germany and Greece help us to better understand different expressions, and distinct roles, of social capital in different locations. Specific circumstances in both cases impeded the important role of social capital in uniting and integrating rural areas in the technological innovation processes, such as farmers' decisions to adopt bioenergy crop strategies. In the analysis and discussion, we paid particular attention to three elements of social capital: trust on the level of institutions, cooperation, and the cultural value of farming. The case studies show that all three dimensions play in various ways a very important role in the adoption of bioenergy crops by farmers.

In the two case-studies, we found different expressions of social capital. Lack of trust in institutions played a central role in both cases. In the case of Greece, it was a general mistrust in institutions that played a central role, while in Germany, the effectiveness of trust was issue-specific and directed towards certain institutions at various levels, such as the state, EU policies, NGOs, etc. In Greece, due to the economic crisis and the accompanied severe austerity measures, trust in the government and general regulatory institutions has further decreased. In addition, and according to our analysis, this decline in institutional trust in both Germany and Greece should be accompanied by a decreasing tolerance of innovation-adoption ambiguity. On the other hand, mistrust towards formal institutions may lead to an increased reliance on or willingness to develop peer-to-peer groups or cooperative relations. Interestingly, cooperation played a key role in the case of Germany and, although cooperation was considered highly important in the case of Greece, participants exhibited low levels of trust in cooperation. In situations where formal institutions partly respond to small farmers' needs and trust is low, informal ties and relations serve as valuable sources of agriculture and rural development, as illustrated in the German case study. However, and according to Wiesinger [57], strong linkages within a closed community may bring about rejection of innovation such as, for example, the adoption of bioenergy crop cultivation. In all cases, however, research shows that the dimensions of social capital must be taken into consideration when discussing energy transition [104], including energy from bioenergy crops.

The engagement in producer groups and other forms of information actions is an important success factor that contributes to the culture and value of farming. Greek participants express negative attitudes towards cooperation, and do not appear to experience trustful relationships. This might indicate that individualism has deepened rural qualities and values. Lack of co-operation in formal and informal levels may have hampered more than rural development strategies and approaches leading, thus, to a degrading role of farming communities in difficult economic contexts, such as the one Greece has been experiencing since 2010. However, particular economic contexts may also lead to the necessity for small-scale farmers to adopt practices that are in opposition to their values, particularly when they are subsidized (i.e., bioenergy crops).

Culture and the value of farming also affect the way in which people interact, cooperate, and perceive new technologies. It may sometimes inhibit innovation adoption technologies, for example when having to conform to well-established business networks on the one hand, and strong farmer oppositions associated by "big farming business" as illustrated in the case of Germany. Generally, cultural capital can contribute to maintaining interest in a rural area *"because the area that I live has a strong agricultural mindset"* [Farmer (b), Germany] which, in turn, may foster and promote informal activities of co-operation and social cohesion amongst those that want to stay and live in that territory. The German case study provides an illustration of the positive role of social capital in maintaining a sense of community in order to coordinate social and economic activities based on traditional agriculture.

In specific historical circumstances and difficult economic contexts, such as in the case of Greece, the culture and value of farming is devalued. This may suggest that

Greek farmers might be more apt to assimilate bio-energy innovations than their German counterparts, because the adoption of drought tolerance bio-energy crops can be perceived as a “third leg” of economic sustainability in rural areas (i.e., increase employment and youth maintenance), and thus be considered as a more efficient coping mechanism for innovation-adoption uncertainty, and support energy autonomy for the rural community in times of crisis.

However, we should be cautious with generalizations of our results, since cultures are in a constant flux. Based on an exploratory analysis of our two case studies, we can only derive an initial understanding of the processes that are underlying social capital and trust building. Social capital plays a very important role in agriculture, sustainability, and rural development transitions and innovations. From the three dimensions that we examined, the ones that were most often important by farmers involved in the case studies were trust in institutions. Cooperation and the cultural value of farming also appeared as critical elements of rural development and, specifically, on the adoption of bioenergy crops. Strong or weak informal forms of cooperation can be key for rejecting (i.e., German case study) or accepting (i.e., Greece) the cultivation of bioenergy crops. The German case study, in particular, shows that culture and the value of farming in contemporary rural space attaches to them a strong occupational identity and community. A well-connected individual in a well-connected community may bring rejection of innovation adoption technologies. In the case of Greece, the perceived culture and value of farming are assigned a marginalized role, thus weakening different forms of cooperation and trust contributing to an ambiguous occupational identity. This uncertainty, which has its roots in a decline in economic and cultural capital, may lead more easily to the acquisition of innovation adoption technologies, such as the cultivation of bioenergy crops. It is therefore worth investigating not only how social capital can be reinforced, but how trust in institutions, trust in cooperation, and the cultural value of farming can also be “built”. Social trust cannot thrive without an institutional background, and the cultivation of bioenergy crops cannot be adopted by farmers if policies do not encourage cooperation and provide opportunities for learning and thus promoting trust.

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