



Social and Technological Transformation of Farming Systems: Diverging and Converging Pathways

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Three-fold embeddedness of farm development

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Abstract: Farm development strategy is affected by, and affects, the biophysical and socio-economic context of the farm leading to agri-environmental challenges for farm development. For effective policies and support programmes it is important to understand the drivers for choices for farm development. Three-fold embeddedness is used to study how farmers relate to the context in which they operate. Ideal-typical farms were constructed for three patterns of farm development found in a quantitative study of dairy farmers operating in highly comparable conditions. The patterns are: 1) Milk Max: maximising total milk production; 2) Milk Balance: optimising milk production based on own resources; and 3) Milk Plus: diversified on-farm production. Their embeddedness in three sets of relations were conceptualised as: 1) value chain relations; 2) socio-cultural relations; and 3) resource relations. The extent of the embeddedness has been determined on a scale ranging from a Close to a Stretched set of relations. These ideal-typical farm types were shown to have different sets of relations for the three dimensions. A set of relations that is stretched outside the everyday routine of dairy farming appears to be important for farmers' perception of options for farm development.

Keywords: Farm development, dairy farm, embeddedness, strategy, perception

Introduction

Can we increase the understanding of the heterogeneity in farm development by looking at the embeddedness of the farm? This paper uses embeddedness of the farm(er) in the biophysical and socio-economic context to study the differences between farmers in their perception of options for farm development. In a case study of dairy farmers operating in highly comparable conditions, farmers indicated on a 5-point Likert scale their perception of the viability of a range of options for farm development. A quantitative analysis of the data showed the presence of clusters in the case study group. The clusters proved to represent coherent patterns of the perception of options for farm development, in this study called the 'perceived Room for Manoeuvre' (pRfM) (Methorst et al., 2015). The farmer as decision maker has agency and perceives or creates a room for manoeuvre within the influence of structures on the development of the farm (structuration theory (Giddens, 1984)). In a follow-up study, the personal views and preferences of the farmer were shown to be the most important driver to explain the differences in the pRfM of the farmers (Methorst et al., 2016). The question for the current paper is whether the embeddedness of the farms can increase the understanding of the differences between the patterns of pRfM. For this purpose, this paper studies differences in the embeddedness of the farm(er) in the biophysical and socio-economic context of the farm.

Understanding differences in farm development is important as farm development is affected by and affects the biophysical and socio-economic context in which the farm operates (Bieleman 1987; Feola et al., 2015). In the biophysical and socio-economic context of a farm, a range of stakeholders have a direct or indirect interest in farm development. An example is when farms affect vulnerable public goods, for example nature and landscape (Primdahl & Kristensen, 2011; Wästfelt et al., 2012). Decision making on farm development starts with the perception of the individual farmer and takes place in a complex system and therefore needs to be studied in an integrated way (Hansson & Ferguson, 2011). The selection of a farm strategy is done by the farmer in the role as entrepreneur following an explicit or implicit farm development strategy. Entrepreneurship is not purely driven by economic parameters, it is embedded in and connected to a biophysical and socio-economic context (Welter, 2011; McKeever et al., 2015). A better understanding of the embeddedness of farm(er)s is important for the design of public policies and support programmes (Korsgaard et al., 2015). Farm development is important for rural economic development and needs to be in line with sustainable land use, a key challenge for rural areas (Woods, 2012).

Analytical framework three-fold embeddedness

Heterogeneity in farm development is based in the development of farming systems in relation to the characteristics of their surroundings (Bieleman, 1987) and in the differences between farmers in the strategy to optimise and increase production (farming styles research, Ploeg and Ventura 2014). Agricultural modernisation leads to increased outputs per farm while also resulting in a negative effect on the quality of the landscape and of biodiversity values (Marsden, 2003; Wiskerke & Roep, 2007). The link between the location of production and consumption became less relevant, a process described as dis-connecting, dis-embedding and dis-entwining of food production (Wiskerke, 2009). In reaction, alternative farm strategies have developed emphasising the localness of food and the multi-functionality of farms based on localness of products and the characteristics of the rural context (Potter & Tilzey, 2005; Oostindie, 2015). In farm development this means there are various options which differ in their embeddedness in the biophysical and socio-economic context.

Three-fold embeddedness

The concept embeddedness is introduced to study the social dimension of economic activity. Granovetter (1985) is widely acknowledged for revitalising the concept in economic sociology as the incorporation of social relations into economic action (Dequech, 2003). In literature the concept embeddedness appears to be used from different perspectives. Jack and Anderson (2002) focus specifically on the meaning of an individual's ties to the local social structure leaving out the other aspects of embeddedness. In literature on food networks, embeddedness is used to theorise the development of alternative food networks (Morgan et al., 2006; Akgún et al., 2010; Roep & Wiskerke, 2012). In the context of food networks, embeddedness is used to study the social dimension and the ecological and cultural relationships of a food system in the territorial context of food production (Sonnino, 2007). Embeddedness of food production is then seen as 'the replacement' of food and food production in its local context in response to the 'dis-embedding' forces of conventional food networks (Goodman & Goodman 2009 p.208). However, this approach introduces the risk of a binary division between 'good' local-embedded and 'bad' global dis-embedded food systems (Sonnino, 2007). Embedded then becomes normative as it is seen as a 'unique, distinguishing, almost magical' attribute of alternative food strategies (Hinrichs, 2000 p.297). To avoid using a normative and binary

approach, embeddedness can best be viewed as a dynamic process that can vary and is the object of management choices (Sonnino, 2007; MoraguesFaus & Sonnino, 2012). The dynamic process approach places the emphasis on the agency of an actor in making choices. Resulting from a study on the different uses of embeddedness, Hess (2004 p.176) states that a reconnection to the original meaning of embeddedness is needed: 'the social relationships between both economic and non-economic actors', or: 'who is embedded in what'. This view focuses on the extent of the embeddedness as opposed to a binary approach.

Hess extracts three general dimensions to be used in the study of embeddedness: 1) **Societal embeddedness** - signifies the importance of where an actor comes from, considering the societal (i.e. cultural, political, etc.) background; 2) **Network embeddedness** - describes the network of actors a person or organisation is involved in; and 3) **Territorial embeddedness** - considers the extent to which an actor is 'anchored' in particular territories or places (Hess, 2004 p.177). These three dimensions are used in this study to study the embeddedness of the patterns of farm development. The dimensions are carefully re-conceptualised in the specific context of dairy farming to ensure a clear and meaningful understanding of each dimension. The societal embeddedness is re-conceptualised as **socio-cultural relations** of the farmer, asking how farmers view themselves as a farmer, what 'culture' of farming does the farmer 'belong' to, what is the identity in values, norms and opinions. The network embeddedness is re-conceptualised as the **value chain relations**, asking which value chain the farm is a part of or linked to, or which networks or spheres of influence affect farm development. The territorial embeddedness is reconceptualised as the **resource relations** of the farm, asking about the origin of the resources for farm production. For measuring the extent of embeddedness each of the dimensions needs to be operationalised which will be further explained in the methodology section.

Methodology

The case study context

The unique value of Kampereiland (*Island of Kampen*) as a case study is the highly comparable biophysical and socio-economic context for all dairy farmers, allowing a focus on differences between the individual farmers. Kampereiland is a typical Dutch river delta where the landscape is influenced by centuries of farming. All 108 farms (of which 102 are dairy farms) are tenant farms using 4000 ha of agricultural land with the town of Kampen as lessor. The culture and identity of Kampereiland is influenced by its history as an island, even though the town of Kampen was less than 10 km away. The 600 person community is well organised with various activities and organisations. The former coastal areas were designated as Natura 2000 nature reserves (2011) and Kampereiland became part of a National Landscape (2005). The policies and legislation concerning Natura 2000 and the National Landscape limit the possibility of scale enlargement, the predominant strategy in Dutch dairy farming in reaction to the end of the European Milk Quota system (Meulen et al., 2012). The change in EU dairy market policies has increased price volatility while accessibility of capital for investment decreased due to the financial crisis. Dairy farming in Kampereiland is also affected by national and supranational legislation on the environment, animal health and animal welfare. Farm income in Kampereiland became worrisome in comparison to dairy farms outside Kampereiland (Duitman, 2005; Methorst, 2013). The lessor's policy is to take care of the 'heritage of our fathers' using four guiding principles: 1) retain property of Kampereiland; 2) obtain a reasonable financial return; 3) take care of nature and landscape values; and 4)

conduct a loyal tenancy policy. A farm has on average around 45 ha in use including land owned or rented outside of Kampereiland; to buy land farmers need to go to neighbouring areas (5+ km). Farm income in Kampereiland relies on dairy farming, often supplemented by an off-farm job. There are no organic dairy farms at the time of the survey and less than 10 farmers are engaged in diversification of their farm. The milk is delivered to (inter)nationally operating dairy organisations, mostly cooperatives.

Data collection and processing

In a survey (February 2013) all 102 dairy farmers were asked to rate on a 5-point Likert scale the perceived viability for themselves of 15 options to generate a substantial part of farm income; resulting in 79 completed questionnaires. Local experts assessed the 23 non-respondents as not deviating in their characteristics from the respondents. Using principal component analysis (Varimax with Kaiser Normalisation) three factors (dimensions) were found: diversifying, ending and maximising production. The dimensions were used in a two-stage cluster analysis leading to four clusters of farmers (Methorst et al. manuscript in preparation). The characteristics of the four clusters were determined using information from three sources: 1) the average score of each pattern for the 15 options in farm development; 2) the average production characteristics for each pattern; and 3) interviews with stakeholders of dairy farming on the characteristics of the farms. The interviews included dairy farmers (n=15, selected at random from all four clusters) and stakeholders (n=16) in advisory, supply, veterinary, the lessor and farmers' organisations. The four clusters were identified as coherent and meaningful patterns for the perception of options for farm development. The ideal-typical set of characteristics was determined for the different patterns. Ideal-types are a coherent theoretical concept that is "*formed from characteristics and elements of the given phenomena but it is not meant to correspond to all of the characteristics of any one specific case*" (Soliva 2007 p. 63). Ideal-types can help to identify patterns of variance (Doty & Glick, 1994) and to give meaning to the patterns found.

The scale to measure embeddedness

Using the ideal-typical characteristics of the different patterns, the extent of the three-fold embeddedness was determined for the farm and farmer in the function of producing dairy on the address where the farm is located. Each farm has a location with its own local supply of resources of a social, cultural, human and natural character (Casini et al., 2012 p. 197). To estimate the extent of the embeddedness a scale was used ranging from a 'Close' set of relations to a 'Stretched' set of relations. The results are a qualitative estimate, leading to a position on the scale between Close and Stretched. This position resembles three sliders on a sound mixing panel. The sliders can be positioned on the scales and the combined positioning represents the characteristics of the farm(er).

The following guidelines were developed to determine the extent of the embeddedness between Close or Stretched. **Socio-cultural relations** of the farm(er): to what extent do they represent an attachment to the land in use and to the direct surroundings of the farm, both physical and social. Does the farmer 'belong' to this location (Close) or could the farmer easily move to another farm in a different location (Stretched). How does the farmer position himself, as caretaker of the farm and its land (Close) or as manager of an economic activity (Stretched). **Value chain relations** of the farm: how is the relation of the farm with the market outlets of its product. Are the products part of a globalised value chain where products are marketed anywhere in or outside Europe (Stretched) or is it a value chain where products are marketed

using a brand linked to the farm or the region (Close). Is the farm(er) primarily connected to the agri-industrial oriented value chain network (Stretched) or is the farm primarily connected to the agri-food oriented value chain network (Close). **Resources relations** of the farm: where do the resources come from (mainly feed and fertiliser). Is it primarily based on the agro-ecological view to be self-proficient in producing feed (Close) or is it primarily based on the agri-industrial view to use all resources available to maximise farm output (Stretched).

Results

Four patterns of farmers' perception were found which were named Milk Max, Milk Balance, Milk Plus and End Milk. **Milk Max** (n=29): farms aiming to maximise total milk production using high levels of input to create a high output. Dairy farming is seen as a technical process guided by financial parameters. **Milk Balance** (n=21): farms aiming to optimise total milk production within the limits of feed produced on own land using limited additional inputs to optimise milk production. Dairy farming is seen as producing dairy while accepting the natural limitations in available resources. **Milk Plus** (n=21): farmers open for other sources of income from on-farm activities (e.g. care, recreation and nature) next to a Milk Balance strategy. The organisation of the farm aims to reduce the pressure on operational management allowing investment of time and energy on other on-farm activities. **End Milk** (n=8): farms aiming to end milk production in the coming years, either due to pension without a successor or due to the economic situation of the farm. Farmers aim not to move, the land will be transferred to other farmers and the farm facilities are taken out of (dairy) production. End Milk is not used for further analysis given the diversity of reasons to end milking and the low number of farmers. The following paragraphs will describe the three-fold embeddedness of three ideal-typical patterns, the results are summarised for all three patterns of dairy farming in Table 1.

Three-fold embeddedness of Milk Max

For **Value chain relations**, the farm has a primary focus on producing dairy as commodity product for the dairy industry using a high input production system. The farm is aimed at producing as much milk as possible within the legal and economic constraints and the farmer aims for farm size development. The farm functions as a production unit with economic parameters as guiding principles in decision-making. The farmers are actively related to advisory organisations in business management, both general and in the (dairy) farm sector

In the **Socio-cultural relations**, the farm is seen as an enterprise and the farmer as entrepreneur and business owner. The farmer gets satisfaction from a well-managed, smoothly running farm operation. The farmer takes pride in how they farm and positions it as their active choice to do so.

The farm and the farmer's family are not necessarily connected. The farmer is interested in general business networks.

In the **Resource relations** the economic usefulness as a resource for production is the main viewpoint. The decision which resources to use is the result of an economic calculation. Local surrounding is primarily seen through the lens of usefulness for production.

Threefold embeddedness of Milk Balance

For **Value chain relations** the farm is focused on the conventional dairy value chain where milk is a commodity while practising a production system based on (relative) low external inputs. Economic return is the result of all decisions and activities, not the primary goal.

Participating in an added value dairy value chain is an option, e.g. organic dairy. Critical about the trend towards both scale enlargement and diversification of the farm. Does not believe in diversification of on-farm income sources, hesitates partly because investments are needed, partly because of how it will affect their farm business activities

For **Socio-cultural relations**, dairy farming is a way of life with a strong base in local culture. The farmer gets satisfaction from being part of the farming culture, working with land and animals. The farmer can be a bit focused on doing it the way he is used to. The farm and the farm family are connected. The farmer is open for co-operation in wider goals like sustaining landscape and nature values as long as it will not limit the process of his farm to too great an extent. This co-operation is more seen as a co-production than as a service for which a payment is needed. The urban-rural connection is acknowledged as important, yet not seen as viable (next to dairy) for their farm

In the **Resource relations** the agro-ecological approach is leading, the farm and its natural setting is the base for production. The focus on natural parameters translates into low use of external inputs, the farm itself is the primary resource base for production. Optimisation within the resources available. The successfulness of the farm can be measured as the amount of inputs needed to maintain the productivity of the farm, less inputs is better. Additional resources are used, but with the aim of optimising production. Nature and landscape is more a constraint than resource, though they are as such much appreciated. The farmer does feel connected to and part of his surroundings, the farm belongs there and is part of the heritage of farming in the area. The surroundings are in principle seen as 'outside of my farm', as a separate world that may negatively affect your farm. Farmers have been surprised by and confronted with limitations in connection to nature and landscape which makes them careful now.

Threefold embeddedness of Milk Plus

In **Value chain relations** the farm is part of more than one value chain with dairy production mostly as the main income source. Next to dairy farming, the farmer operates a value chain of products and services directly addressing clients. This value chain is based on the characteristics of the farm and the appeal of the rural setting as valued by the broader society. This type of farm requires a combination of different skills and entrepreneurial competences. The successfulness of the farm cannot be measured in the same production characteristics as for Milk Balance or Milk Max due to the diversity in activities. The approach to dairy farming resembles Milk Balance, the agro-ecological approach to farming, the farm and its natural setting as a base for production

In the **Socio-cultural relations**, the farmer identifies the farm and farming as more than a production location, it is as well a source of wellbeing for (local) society. The farmer values (societal) recognition for the positive effects of his work on the urban-rural relation, the farmer is very motivated to contribute to the region and add societal value. Monetary value is needed, but not the primary goal, personal life experiences may play a role, some may even risk to invest too much of themselves. The farm is a family business. The farmer is open towards non-farming socio-cultural developments and networks

In the **Resource relations**, the primary resource base for dairy farming is local and resembles the Milk Balance farmers. In addition the farmers are open for alternative use of resources in the area; the farm itself, the farming lifestyle and the rural context is seen as a resources as

well. The farmers likes to see a farm that is well embedded in a landscape and that connects farming with nature and landscape. The farmer actively thinks about and connects to the surroundings. The farmer is open for and may initiate a co-operation in wider goals like sustaining landscape or nature values.

Table 1. Extent of the three-fold embeddedness for the three ideal-typical patterns of dairy farming

	Milk Max	Milk Balance	Milk Plus
Value Chain Relations	Focus on producing dairy as commodity product for dairy industry	Focus on dairy as commodity, possibly part of added value chain (eg organic)	Focus on multiple value chains: 'normal' dairy plus an extra on-farm activity
	Explicit agro-productivist view, farm is production unit, focus on benefits from scale and intensity (Pro-)active related to organisations in the value chain, network oriented Explicitly refers to his position in value chain as an active choice	Implicit agro-ecology view, farm is production unit, focus on benefits from optimising land assets Passive related to organisations in value chain, farm internal oriented Implicitly refers to current value chain as 'the normal thing to do'	Explicit agro-societal view, farm is a unit with multiple functions, focus on multiple use of assets (Pro-)active related to broader set of networks Explicitly refers to added value the farm has to offer
	Close Stretched <----- XXXXXX ----->	Close Stretched <----- XXXXXX ----->	Close Stretched <-- XXXXXX ----->
Socio- Cultural Relations	Positions as dairy farmer running a business Farm and family not necessarily linked, less life style farming Focus on (agri-)business networks, local relations are personal rather than farm related Explicitly refers to the socio-cultural relations using a rational approach	Positions as dairy farmer as a way of life strongly based in local culture Farm and family are connected, life style farming Focus on agricultural networks, mainly local or supplier related Implicitly refers to 'traditional farming' in the socio-cultural context	Positions as (dairy) farmer with multiple services on offer for society Farm and family are connected, the farm is seen as a family business Focus in- and outside agriculture, has interest in (developing) local and supra-local networks Explicitly refers to farm as active connector in socio-cultural relations
	Close Stretched <----- XXXXXX ----->	Close Stretched < - XXXXXX ----->	Close Stretched <----- XXXXXX ----->

Resource Relations	Decision which resources to use is an active choice based on an economic calculation aiming to maximise output	Decision which resources to use is an active choice, feed from own land with added concentrated feed	Decision which resources to use is a passive choice, feed from own land with added concentrated feed
	Local nature and landscape is seen as potential constraint for development	Local nature and landscape is valued, yet seen as possible constraint	Local nature and landscape is valued as added value in the context for the farm
	Origin of resources is of secondary importance	Resource base is primarily local, additional resources to optimise	Local resources as marketing value, additional resources to optimise
	Explicitly evaluates resources on economic added value to maximise a cost effective production	Explicitly evaluates resources as part of the cycle of nature	Explicitly refers to the farm and context as a resource, intangible assets are valued as resources
	Close <----- XXXXXX ---->	Stretched <--- XXXXXX ----->	Close <--- XXXXXX ----->

Discussion, conclusions and implication

Heterogeneity in farm development is well documented in literature on farming styles (Long & Ploeg, 1994; Ploeg, 2003; Ploeg & Ventura, 2014) and in relation to resilience of farms (Darnhofer, 2010). Heterogeneity in farm development cannot be reduced to ‘external’ structural forces such as ‘markets’ or ‘nature’ impacting on farming, even when these are mediated by capable farmers into their every farming practice and decision making. The socio-cultural embeddedness of farmers, their shared values and norms and how they see themselves as a farmer or like to be seen, do matter significantly in explaining different farm development strategies and result in different patterns of farm development; and as this study has shown, this includes farmers’ perception of options for farm development. Next to the socio-cultural embedding as an explanation for how farming is actually practised, also the embedding in value chains and embedding in agro-ecological resources does matter. This three-fold embeddedness of farming offers a new perspective on different patterns of farm development, more specifically on the coherent strategic and operational decisions farmers make in line with their mix of embeddedness. Farmers do play with the ‘sliders’ on the scale of each dimension of three-fold embeddedness according to their views and capacities, and their perceptions of options for farm development, taking into account the dynamic setting they operate in. The three-fold perspective offers a symmetrical analysis of embeddedness and highlights the differences as gradual in contrast to a binary approach where farming is considered to be either (locally) embedded or not (locally) embedded.

The results show to what extent farmers differ in their three-fold embeddedness on a scale between a Close and a Stretched set of relations. The three ideal-typical farms differ in the rationale presented by farmers in describing the characteristics of the three patterns of farm development. The findings show that no strict lines can be drawn in the demarcation of farm development strategies, the transition from one strategy into the other is not on a fixed position in three-fold embeddedness. Different levels of embeddedness may even result in similar visible farm characteristics, but in effect reflect different rationales. There is a difference

between patterns in how explicit the reasoning is for the positioning in three-fold embeddedness. Both Milk Max and Milk Plus are explicit in the positioning for all three dimensions. For Milk Balance, however, the positioning is only explicit for the use of resources, this positioning is in line with their emphasis on optimising the on-farm available resources and a focus on the craftsmanship of dairy farming. Milk Balance is more implicit in the positioning of the embeddedness in the value chain and socio-cultural relations, it appears that an explicit positioning is not needed as how they do it is the 'obvious' to run a dairy farm. However, an explicit reasoning does not necessarily mean that farmers' perception of the options for farm development is voluntary or that it reflects the most preferred farm development strategy. The findings do show that farmers who perceive a Milk Max or Milk Plus strategy as viable appear to be more pro-active in their positioning in value chains than a farmer with a Milk Balance strategy. This indicates a more pro-active approach towards creating room for manoeuvre for farm development. This is likely to be in line with being active in networks outside the traditional, local oriented agriculture network.

The three-fold embeddedness focuses on and studies the different sets of relations of which farming is part of and embedded in. It thus takes a relational approach to farming and farm development (Darnhofer et al., 2016). The gradual approach of embeddedness in three dimensions allows us to overcome the often binary approach found in agri-food literature (Morgan et al., 2006 p. 166). The three-fold embeddedness perspective allows us to analyse in a symmetrical way and in depth the differences between farmers in the perception of options for farm development. These differences can then be related to differences in farm development and to dealing with pressures on farm development, e.g. protection of landscape or nature values. The range of pressures on farm development (Feola et al., 2015) make it a not easy task for a farmer to express his agency in the farm development. Especially diversifying production (Milk Plus) is not a straightforward and easy decision, the motives for diversifying are complex and include non-economic aspects (Hansson et al., 2013). Three-fold embeddedness offers an avenue for further research on these motives for diversifying. A next step in the research can focus on agency of the farmer in creating room for manoeuvre for farm development. Does the farmer create the favourable conditions in line with the mission, strategy and goals, or does the farmer perceive the local (biophysical and socio-economic) conditions as a given situation within which the mission, strategy and goals can be defined and realised. Whether farmers are or are not able to enlarge their room for manoeuvre is of interest for both farm and regional development, especially in regions with natural and landscape values as amenities. A better understanding of how farmers are able to enlarge their agency supports the development of policies and support programmes.

The results of this study are deemed to be valid for (Dutch) dairy farming in general. Kampereiland as a case study is unique in the highly comparable context. However, all farmers operate in a context that affects their development options and this study aims to understand differences in dealing with the context, not the context itself. Furthermore, the patterns found in farmers' perception of options for farm development were acknowledged by farming experts as valid for dairy farming in general. The use of ideal-typical farms may create an emphasis on a combination of farm characteristics that is not clearly present as such in practice. The aim of this study is however to study patterns of variance in empirical observations which are in itself complex and diffuse (Soliva 2007 p. 64) for which ideal-types are a useful tool (Doty & Glick, 1994). The findings need to be interpreted as a study on

differences between different development patterns of farmers and not as absolute results to describe specific types of farmers.

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Asymmetric information along the food supply chain: a review of the literature

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Abstract: Market failure occurs when the market is not able to reach optimal output. In the literature, among the main causes of market failure is asymmetric information. Asymmetric information occurs when parties involved in a transaction are not equally informed. There has been a considerable increase in attention to asymmetric information in economic literature over the last twenty years in several fields, such as agro-environmental scheme payments, food quality and chain relationships. The literature reveals that the agri-food sector represents a field particularly exposed to the effect of asymmetric information. In particular, issues are related on the lack of information on quality, price and safety that frequently occurs in the transactions along the supply chain until the final consumer. Many actions in terms of regulation and policies have been undertaken in order to control attributes in the food transactions, however there is still need to improve conditions in order to achieve a more efficient and competitive market. The purpose of the paper is to review the literature on asymmetric information issues affecting the agri-food chain, the main solutions proposed and the modelling approaches applied in economic literature to understand asymmetric information along the food supply chain.

Keywords: Asymmetric Information, food supply chain, contracts

Introduction

Asymmetric information occurs when parties involved in an economic transaction are not equally informed which prevents the optimal resource allocation. For many years, classic economics did not concentrate on asymmetries since the focus has been on the understanding of the theory of value (Laffont & Martimore, 2009). However, it remained unexplored how an entrepreneur can succeed in profit maximisation with their workers' objectives while also having to delegate tasks to other firm members. A theory developed by Marschank & Radner (1972) recognises the asymmetric nature of information and focuses on the enhancement of the optimal coordination by means of proper information management.

In traditional economic models, players are expected to have perfect information; in reality this does not occur in the majority of cases. This approach, in which actors have perfect information, changed after Stigler's (1961) paper on the "Economics of Information" and the corresponding development of the research field of New Institutional Economics (NIE). It is well known how George Akerlof (1970) became one of the pioneers in this field, by examining the consequences of asymmetric information in the second-hand car market.

Compared to the Classical economical model, modern economies require a high rate of interaction among players. Therefore, over the last twenty years, there has been considerable development in the economics literature of contract design under asymmetric information in several fields such as agro-environmental scheme payments, chain relationships and food quality (Laffont & Tirole, 1993; Salanie, 1998; Laffont & Martimort, 2002). In particular, Antle (2001) stressed the fact that the food market is characterised by imperfect information with asymmetries allocated along the supply chain (Starbird et al., 2007) and which are responsible for a general increasing of costs during economic transactions (Bogetoft & Olesen, 2004). In particular, academics point out the lack of information on quality, price and security that frequently occur in the transactions along the supply chain until the final consumer (Fernandez, 2008).

The food sector by its nature is exposed to unknown characteristics. Quality and safety are in the majority of cases recognisable only after consumption and so are classified as experience or credence good. According to Nelson's classification (1970), experience good refers to attributes identified immediately after purchasing and credence good refers to attributes that cannot be identified immediately after purchasing.

In economic transactions, based on the allocation of the information, two actors are distinguished: the Agent who has the information and the Principal that makes an effort to know about agent action or characteristics of the product being provided by the agent. The consequences of asymmetric information are moral hazard (after contracting), when the action of the agent cannot be observed, and adverse selection (before contracting), when characteristics of the product is hidden to the principal. In the majority of cases in the food sector, the agent tries not to reveal the food quality characteristic and the efforts made by the principal to reveal hidden information causes distortion in the economic decision leading to inefficient results and the exclusion of the product from the market.

A case study reported by Gorton et al. (2006) shows how asymmetric information between farmers and processors could have led to milk market failure in Moldova due to the bad milk quality level, and how the establishment of a robust contract by the company Molmilk had solved the problem. In Moldova, during the communist period, farmers were characterised by a high level of vertical integration. Privatisation determined the break-up of large farms managed by the state and collective farms. The result was livestock fragmentation. Some Milk processor companies such as Molmilk were forced to collect milk from small rural householders which in many cases tended to cheat by adding water or lard to milk or passing on contaminated milk. Additionally, many collecting stations in Moldova were not equipped with any milk quality monitoring system. Therefore, in 1998, around 20% of milk provided by Molmilk from collecting stations was judged unusable. However, Molmilk had paid for the milk provided by rural households at the collecting stations and the damage jeopardised the company's survival.

After this, there has been a considerable and increasing attention on asymmetric information in economic literature over the last twenty years; in several fields such as, agro-environmental scheme payments, food quality and chain relationships (Laffont & Tirole, 1993; Salanie, 1998; Laffont & Martimort, 2002). In particular, modern economies are characterised by a high rate of interaction among players, which are more and more related to their information exchange conditions. Antle (2001) stressed the fact that the food market is characterised by imperfect information with asymmetries allocated along the supply chain (Starbird et al., 2007) which

are responsible for a general increasing of costs during economic transactions (Bogetoft & Olesen, 2004). The understanding of different economic and social conditions that affect actor collaboration along the supply chain is a key to boosting the competitiveness of European agriculture. The solution of information asymmetries is part of this process.

The paper aims to report a review of asymmetric information issues affecting the agri-food chain and the main solutions proposed and modelling approaches applied in the economic literature to understand asymmetric information along the food supply chain. This study provides a list of modelling approaches adopted to solve the different asymmetric information problems addressed in literature between actors along the food chain.

The main issues debated in the academic literature are reported in the literature review section, then some insights are reported into issues related to methodological aspects followed by the discussion and conclusion.

Literature review: asymmetric information in the food supply chain

There is a stream of literature that focuses on the problems of asymmetric information related to food attributes, (Hobbs, 2004; Starbird, 2007; McClusky, 2000; Cooper & Ross, 1985; Elbasha & Riggs, 2003). These authors refer to food safety and food quality, which in many cases are difficult to measure. Therefore, information concerning product safety and several quality aspects (such as ethical or environmental issues) are strongly asymmetrically placed along the supply chain (Starbird et al., 2007).

A critical point is that both quality and safety attributes within the agri-food sector are not always easy to identify and observe in a conservative way (Holleran et al., 1999) along all the agri-food supply chain stages. In many cases they are credence (food attributes that cannot be determined by the consumer even after purchase) or experience (food attributes that can be determined just after purchase) types of attribute.

Food quality and safety has been a highly discussed topic in the last 20 years; in particular food safety because of several issues related to public health. Food quality can have two meanings. It can be intended as a characteristic that a good should meet, such as specific technical attributes compliant with requirements, or as a value i.e. the level of suitability for a specific use. In this latter case the judgement is subjective. Nowadays, the concept of quality is not only related to the efficiency and quality control but more towards a customer-oriented concept. The adding value to a product, and so the increasing of its quality level, depends on customer expectations. According to Lindgreen and Wynstra (2005) two values are distinguished, one related to the buyer supplier relationship and the other to the customer value perception. As stated by Grunert (2005) the concept of quality and safety in agribusiness is mainly driven by actors of the market food chain. In particular, it is acknowledged that supermarkets reflecting the customer needs have become the main actors in the food supply chain (Reardon et al., 2003). However, the perception of value is personal (Swartz, 2006) and because of its abstract nature, (referring to consumer beliefs), it is separated from concepts such as attribute norms that usually relate to objective food aspects.

The food supply chain is defined as a “network of food-related business enterprises” (Stevenson & Pirog USDA, 2013). Therefore, it is characterised by a high level of interactions

where the information exchange affects the success of the chain (Icasati-Johanson, 1999). One of the most important factors for the development of partnership among different actors of a supply chain is trust (Johnston et al., 2004). In the scientific literature, two broad approaches to the concept of trust are adopted: the economic and the social (Williamson, 1993; Lyons & Mehta, 1997). For most economists, in particular institutional economists, trust is assumed as opportunistic behaviour, with the game theory modelling approach adopted to analyse interaction among agents. The social approach, explored by sociologists and anthropologists, focuses on the development and diffusion of trust in relationships. The classical approach in trust analyses the ways in which individuals are bound together and engaged in collaboration.

The present study does not address trust within the supply chain in relation to asymmetries as this is more related to a socio-anthropological approach. Instead, the focus is on opportunistic behaviour generated by asymmetric information with an economic approach.

Some possible solutions are identified in literature to correct asymmetric information in the food supply chain. One consists of acquiring information; however, this implies costs that can increase with the improving level of accuracy of information. The second one concerns the vertical coordination by means of contracts or vertical integration. The third option concerns the adoption of food standards, insurance and certification monitored by third parties. The last option is regulation, where governance applies coordination schemes between private and public agents to promote the compliance of food operators in terms of food safety regulations (Nicita & Scoppa, 2005; Rouvière et al., 2012; Fernandez, 2012).

According to Stringer et al. (2007) the food supply chain can be divided into the following stages: agricultural production, processing of raw material, industrial transformation, distribution and consumers (see Figure 1). Figure 1 also shows how different solution approaches can be allocated in different parts of the supply chain. In particular, the supply chain is characterised by having a multiple stage agency interaction. In fact, farmers delegate production to downstream processors and processors delegate the raw material production to farmers. The application of the most suitable solution is based on the type of food attribute considered, (whether it is a quality or a safety issue), asymmetries type (adverse selection or moral hazard) and on the actors involved in the agri-food chain.

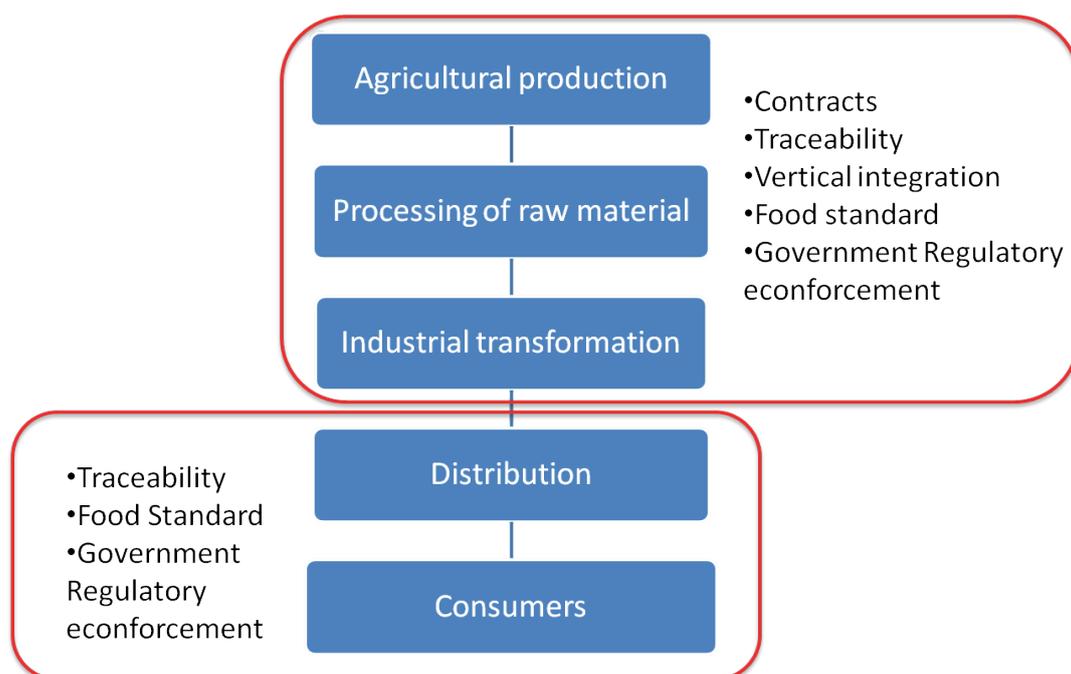


Figure 1. Solution to asymmetries along the agri-food chain highlighted in the literature
(Source: own elaboration based on agri-food chain elaborated by Stringler et al. (2007))

The first contract probably appeared in agriculture (Laffont & Martimort, 2002). There is an extended stream of literature on contracts in agriculture, most of them in developed countries (Bogetoft & Olsen, 2002; Goodhue et al., 2004; Fraser, 2005; Fernandez-Olmos, 2008) and a few in Eastern European countries (Ferto, 2009; Bakucs, 2013). According to Bogetoft and Olesen (2002) coordination by means of contract allows achievement of an optimal production along the production chain. The main advantages of engaging in a contract from the farmer's side are a shift of the risk, an income stability and a market security. The disadvantages are recognised mainly in a reduction of flexibility in the management and possible penalisation in price. For processors, the contract solution allows them to have stable provision in terms of raw material and quality.

Between academics, Hennessy (1995) stresses the importance of vertical integration as a solution to the increasing demand for safe food. In fact, vertical integration guarantees the disclosure of qualitative and technological food attributes which are problematic to achieve, reducing testing cost. However, this solution does not find many applications in practice. In fact, on one side, there is a control of the overall production, but on the other, there is a total shift of risk to the owner. In the matter of vertical coordination, Worley and McClusky (2000) recognise the important role of a production contract. The PA model proposed in their paper, allows segregation of producers with desirable requirements. The model developed focuses on a quality type of attribute. In particular, the model should allow the designing of a contract with authentic IP wheat producers. In a similar way, Starbird (2007) explores the role of contract design for the food safety attribute. The paper proposes a model that allows segregation of safe from unsafe producers based on the failure inspection cost and the bid price. If the bid price for safe contracts is lower than the bid price for unsafe contracts, then the processor will chose the safe contract, if vice versa he will chose the unsafe contract. This can happen when the cost of safety failure (called cost allocation factor) and the production

cost is low. In this case, the processor will offer a bid price that segregates unsafe producers. In conclusion, the paper targets: regulators to improve and support a traceability system by means of appropriate cost allocation; producers to determine if a processor contract is appealing or not; and processors to help design contracts that segregate unsafe and safe suppliers.

As previously stated, shifting from producers to the consumer side along the food chain the amount of information decreases. According to some academics, the only way to convey such information and so protect the consumer is the application of regulations such as traceability and food scheme certification. Some of the key studies here are those of Hobbs (2004), McClusky (2000) and Segerson (1999).

A traceability system has been introduced among possible solutions to asymmetries of food safety and quality attributes by Hobbs (2004) who differentiates functions between ex-post and ex-ante traceability and identifies a different impact on asymmetric issues. Ex-post traceability has an impact on liability and externality costs. Ex-ante has an impact on quality verification. To test these impacts Hobbs adopts a Game Tree model that allows observation of different profit because of firms' decisions to adopt traceability decisions and the probability of actions imposed by the Regulator. Hobbs provides also a traceability system taxonomy in which he suggests, based on the food attribute, the best traceability system. The main evidence from the study is that, for safety issues, the ex-post certification with strong government enforcement is essential. For the quality attribute ex-ante traceability can also work well, imposing a third party monitoring system on firms upstream.

McClusky (2000) analyses the traceability issue from the perspective of the consumer analysing the problem of a false organic food claim. Since organic is a credence type of attribute, the only way for the consumer to know that the product is not authentic is if, after some purchases, the producer is caught, making any future organic claims false. Once this happens, the consumer will not buy that product anymore. The paper highlights the importance of a monitoring level in order to prevent false claims and the reputational factor in the modelling approach. Moreover, when retailers and distributors are within the supply chain the organic food market often bears the cost of verifying organic claims, in order to provide required information to the consumer. McClusky demonstrates that the minimum necessary level of monitoring depends upon the price of organic food (the cost difference of producing organic versus non-organic) and the discount rate. If the difference is higher, the probability of being caught must be high in order to compensate for the large one-time benefit in cost reduction. This can be applied to any food quality attribute. In particular, the conclusion underlines the importance of government in standardising the requirement for organic product claims.

Table 1. Main literature on asymmetric information along the agri-food chain (Source: own elaboration)

PROBLEM	ASYMMETRY TYPE	PROPOSED SOLUTION	ATTRIBUTE	MODEL	SECTOR	ACTORS	REFERENCE	MAIN CONTENTS	FINDINGS	REFERENCE
Safety	Adverse selection	Contract	Credence	Principal agent defines the bid price in order to segregate unsafe and safe producers	Agri-Food	Producer-Processor	Starbird 2007	2 types of producers: one with low contamination rate (safe producers) one with high contamination rate (unsafe producers) it is safe if meet government Standard. Producers' capacity exceeds the processor's finite demand so demand can be satisfied by safe producers or unsafe producers.	Regulators: to act on cost failure. Processors: to help design contract that segregates unsafe and safe suppliers. Producers: to determine if processor contract is appealing or not	Journal of agricultural and food industrial organisation
Safety and quality	Moral hazard	Traceability	Credence & Experience	Game Tree-model of ex-ante quality verification system post traceability system to demonstrate different function of incentive	Agri-Food	Agri-food chain	Hobbs 2004	Ex-post traceability to track back contamination problem Ex-post traceability used to test allocation liability Ex-ante traceability to detect experience attribute	Ex-ante traceability system with private market incentive is sufficient as quality verification function. Food Safety attributes require ex-post traceability system with	Agribusiness

Quality	Adverse selection	Production contracts	Credence & Experience	Principal agent model to design a proper contract in order to maintain the IP	Wheat market (Identity preserved)	Producer / Processor	McCluskey 2000	The contract role in reducing asymmetric information in agri-food chain.	The design of a proper contract between processor and IP wheat producer	Journal of food distribution research
Safety	Moral hazard	Certification	Credence	Game tree to determine the condition in which voluntary approach is adequate to guarantee protection toward consumer	Agri-Food	Agri-food chain	Segerson 1999	Test if voluntary monitoring system is adequate to guarantee consumer protection	For food quality attribute depends on the level of consumer awareness. For food safety attribute the role of government enforcement is essential	Agribusiness
Quality	Moral hazard	Label/Monitoring	Credence & Experience	Game tree to define the necessary level of monitoring	Organic	Agri-food chain	McCluskey 2000	The study demonstrates that the minimum necessary level of monitoring depends upon the price of organic food and the discount rate. If the difference is high the probability of being caught must be high in order to compensate for the large one-time benefit in cost reduction.	For experience attribute the voluntary system is sufficient (reputational aspect is repeated purchasing). For credence attribute the role of regulator is essential	Agricultural and resource economics

Segerson (1999) is one of the first academics to analyse mandatory regulation versus incentives for a voluntary approach, identifying the condition in which a firm would adopt a voluntary food safety standard. Findings shows that the market can induce voluntary adoption for experience and search food. However, this condition is not suitable for credence food, where mandatory monitoring systems are required. Table 1 gives an overview of the literature discussed above.

One of the main problems arising from asymmetric information is the goal conflict between two players; the general modelling approach adopted by economics in literature to analyse asymmetries in the food sector can be mainly attributed to a strategic game composed of a leader and a follower. As previously stated, asymmetric information causes: moral hazard, when an agent undertakes hidden actions against a principle after economic agreements; and adverse selection, when an agent hides information on services or goods before purchasing. Academics address the problem of hidden actions (moral hazard) by means of the Principal Agent model approach offering incentives in order to prompt the agent to behave accordingly with the goal's principle. In the same way, adverse selection problems are approached with the same modelling approach that provides a menu of contracts that allow the identification of desired goods or services or to aggregate suitable agents. Hence, modelling approaches adopted in literature to explore asymmetric problems come from game theory. Specifically, in the food sector, academics adopt game tree to analyse the problem of moral hazard related to certification or regulation along the food chain and a principal agent model adapted from incentives theory (Laffont and Martimore, 2002) to analyse adverse selection problems (see Worley & McCluskey, 2000; and Starbird, 2007).

In this term, McClusky (2000) addresses the problem of the third party monitoring level necessary to ensure labelling integrity of organic products. Because of the experience and credence attributes which characterise food products, the concept of one stage game is introduced. In fact, if the buyer and the seller interacts only one time there is a moral hazard from the producer side as his goal is to produce at the lowest cost and then adverse selection occurs. If the customer repeat purchases from producer, the hidden information is unravelled in the following purchasing act. To explore this dynamic a finitely repeated game is developed with standard game theoretic assumption. Therefore, because of the reputational factor due to the long term relationship, monitoring is not necessary. The action of selling false claims is then prevented.

In Table 2 the summary of solution approaches adopted in the literature based on the asymmetric information type is reported. Starbird (2007) and Worley (2000) address the problem of asymmetries ex-ante related to adverse selection by means of contracts. With a contract, they try to segregate safe/ IP wheat producers from unsafe/non-IP wheat producers. Instead, McClusky (2000), Segerson (1999) and Hobbs (2007) explore asymmetries related to hidden actions (moral hazards) which are addressed by mean of certification, product labelling and a monitoring system (public or private).

Table 2. Solutions in response to asymmetry types from literature review

		Safety		Quality	
		Adverse Selection	Moral Hazard	Adverse Selection	Moral Hazard
Safety	Adverse Selection	Contract			
	Moral Hazard		Certification		
Quality	Adverse Selection			Production contract	
	Moral Hazard		Traceability		Monitoring systems

Discussion and Conclusion: AI issues and modelling implications

The literature highlights different solution approaches; which one is the most suitable depends on each specific case. In particular, in the case of quality attributes, more insights are necessary to evaluate which possible solutions are better between actors at the beginning of the food chain, i.e. contract or certification. Generally, when the main objective is to protect the consumer from contamination that can cause serious illness i.e. when asymmetries are associated with externalities or public goods, the role of government enforcement is essential (Nicita & Scoppa, 2005). Literature stresses the essential role of institutions in providing regulations and acting with penalties where cases of noncompliance are found. In other cases, where soft safety requirements are involved, different solution options can be considered depending on a mix of several aspects related to the safety and quality attribute of the product.

McClusky (2000) adds the reputation as a factor that can limit cases of adverse selection and moral hazard. This is true in the case of long-term purchase relationships and for experience food only.

From the extensive literature review carried out it emerges that problems of ex-ante asymmetries related to adverse selection are addressed by means of contracts, while ex-post asymmetries related to hidden action (moral hazard) are addressed by means of certification and monitoring systems (public or private). In terms of modelling, the principal agent model adapted from Incentive Theory (Laffont & Martimort, 2002) is applied to design proper contracts able to segregate authentic claimers and then reduce adverse selection effects. Game tree is used to model the adoption of certification systems and monitoring systems along the food supply chain in response to moral hazard.

The problem of information asymmetries affects all actors along the agri-food supply chain: farmers, wholesalers and retailers, processors, consumers, third parties (quality agencies) and public regulator. Literature tries in some cases to explore asymmetric issues in separate

blocks focusing on the relationship between a few actors, or attributes such as safety and quality.

It can be observed that literature on the topic of asymmetric information along the food supply chain in economic dedicated journals is not extensive. Because of the multitude of actors involved and multidisciplinary issues, there are strong linkages with several other scientific fields besides the economic one.

In regards to the methodological approaches, the primary role of research should be to understand and rationalise existing practice. In fact, often practitioners design contracts without referring to contract theory. Based on these considerations a mix of theoretical based approaches to reality and dissemination of information between different agricultural sectors should be carried out in order to improve contract design.

Papers on contract theory analyse one or at most a few problems. This approach is acceptable in order to stylise problems. However, this is a partial approach that seems insufficient to face the several issues existing in practice. As argued by Bogetoft and Olsen (2004) the complexity of the real world of contracts requires a more systematic approach able to consider all aspects of a contract simultaneously. It would be necessary to introduce more elaborated multi-dimensional production models (Bogetoft and Olesen, 2004) and to focus greater attention on actual institutional and regulatory settings.

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Strategies of fishers and fish farmers: a preliminary analysis for sustainable fisheries and aquaculture

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Abstract: Coastal capture fisheries and aquaculture are interconnected resource systems and economic activities, presenting evolving and complex dynamics, constrained by several socio-economic, policy and biophysical factors. Overfishing and climate change are modifying the distribution and productivity of marine species and altering food webs. The general economic situation has worsened, influencing markets, costs and purchase power. This paper aims to present a preliminary analysis of the multidimensional causal dynamics of key drivers and market factors influencing the decision-making process of Fishers and Fish Farmers, identifying conditions in which primary producers are involved, the related strategies developed to manage those conditions and the consequent performances in terms of profitability and sustainability. Derived from industrial organisation and agro-food value-chain management a research process is proposed for analysing conditions, strategies and performances of primary producers of fisheries and aquaculture. The analysis in this paper is situated in two specific contexts: inshore fisheries in Cornwall (UK) and coastal fisheries and aquaculture in Tuscany (Italy). Sustainability of fisheries and aquaculture is jeopardised by a set of socioeconomic and biophysical conditions such as habitat degradation, over-exploitation of resources, complex and restrictive regulatory frameworks, increasing illegal competition, rising costs, market concentration and excessive fragmentation of holdings. Response strategies can be found in investing for innovation, regulating catches and capacity of fleets, training of operators, reorganising the supply chain, multifunctionality and diversification, implementing cooperative programmes and supporting sustainable development. Engaging with stakeholders and experts and accessing qualitative and quantitative information will be key to comprehensively analyse how primary producers develop decision-making process and transformation strategies towards sustainable solutions for fisheries and aquaculture.

Keywords: Fisheries & aquaculture, primary producers, sustainable management, decision making, participatory methods, resilience

Introduction

The decline of marketable fish stocks and the increasing fishing pressure has brought a change in fisheries policies and management systems at a global level over the last decades. Overfishing - due to changes in consumption patterns - and climate change are modifying the distribution and productivity of marine and freshwater species and altering food webs. Moreover, the general economic situation, influencing markets, costs and purchase power of consumers, has worsened. Fishers and Fish Farmers (FFF), as primary producers and economic agents, are also deeply affected by the impact of climate change on aquatic ecosystems, through rising sea levels, ecosystem degradation, acidification, droughts and floods. There is evidence too that commercially-important stocks are exploited close to, or beyond, the rate that will deliver Maximum Sustainable Yield, and economic performance of the fleets shows highly variable trends leading to uncertain outcomes. Furthermore, overcapitalisation and disproportionate fleet sizes, undervaluation of catch, huge fuel expenses, insufficiently selective gear, unreliable databases, and rising competition between artisanal fishing and a large-scale capital intensive fishing industry (and between fishing and other types of activities such as tourism) has put at risk the long-term sustainability of the fisheries sector (Higgins et al., 2008; Cardinale et al., 2013; Urquhart et al., 2014; Damalas et al., 2015).

A conceptual framework applied to fisheries and aquaculture: state of the art

The theoretical approach of this work builds on the conceptual framework of the H2020 Project SUFISA (see Appendix 1), and aims at highlighting the relations and processes that connect the conditions in which agro-food primary producers (e.g. fishers and fish farmers) operate with their strategies and the related performances, which in turn affect primary producers' business environments.



Figure 1. Conditions, strategies and performances of primary producers (SUFISA Conceptual Framework, 2015)

"Conditions" refer to the whole business environment, interpreted in a broad sense to cover all the main determinants influencing primary producers' behaviours. The "Strategies" category comprises the range of actions consciously adopted by the primary producers in order to achieve some performances with a noticeable impact on the production development trajectory. "Performances" are the consciously pursued effects of the strategies. The goal is to disentangle primary producers' decision-making processes, analysing the ways in which they interpret their internal (at the firm and household level) and external conditions and use the resources they have access to, in order to pursue their objectives (SUFISA Conceptual Framework, 2015).

The Conditions-Strategies-Performances framework, applied here to fisheries and aquaculture primary producers, builds on the theories of industrial and organisation economics, in particular it can be deemed as a dynamic variant or adaptation of the Structure-

Conduct-Performance paradigm from Porter (1981). According to Rastoin and Gherzi (2010), the CSP approach could be categorised within the *behaviourist thinking* in which strategies are considered key - strongly focusing on the impacts of strategic decisions upon performance level and on producers and stakeholders' capacity to change the structure of an industrial sector. It would also be different from a *structuralist thinking* that emphasises the role of structure as the principal determining factor for strategies and performances, thus giving less importance to the producer and stakeholder role and strategic decisions.

Industrial economics has been a major influence on strategy theory and research and has showed the contribution towards business (Grimm, 2008). Literature from industrial organisation, management and economics - including from scholars engaged in food system and value chain analysis - offers a set of frameworks that contribute to develop theories and methods trying to represent structures and functioning of sectors. In particular, within classical industrial economics, the theoretical framework *Structure-Conduct-Performance* (SCP) introduced an approach to the sectorial analysis that builds on the interlinkages between market structure, the strategic behaviour or conduct of firms, and the profitability and sustainability of a specific sector (Porter, 1981; Rastoin & Gherzi, 2010). The theory of Industrial Economics was operationalised by the SCP-Paradigm to emphasise links between market structure and business conduct in determining market performance (Edwards et al., 2006). Therefore, the SCP-paradigm is recognised as one of the most efficient and reliable means by which to analyse an industry or more specifically the market power-profitability relationship within it. The SCP-paradigm consists of three basic elements, all indicated by different variables, which are: structure, conduct (behaviour), and performance (Carlton & Perloff, 2000). This paradigm suggests that a series of basic economic conditions determine market structure (Norman & La Manna, 1992). According to Bain (1968) and Mason (1939) the industry structure shapes the behaviour, the conduct, and thus the strategies of firms that will determine the performance of the firm in its environment, more specifically, in its marketplace. This analysis gives insight into the market structure the firm operates in, the firm's behaviour and strategy (conduct), and the decisions related to that, that suit this structure, and in the end it shows what the influence of this conduct is on the firm's performance in terms of profits.

Within the SCP paradigm, the industry *structure* was identified by the presence of the relatively stable economic and technical dimensions of an industry that constitute the context where competition occurs (Bain, 1972; Porter, 1981). Subsequently, the structure explains the *strategy*, or conduct implemented, which represented the application of choices and trade-offs within a number of variables such as price, quality and capacity of production, marketing, Research & Development, contracts etc., and that was deemed essentially as "*the economic dimensions of firm strategy*" (Porter, 1981 pp. 611). Concomitantly, strategy leads to a number of outcomes, more specifically defined as *performances* that involve profitability, technical efficiency for cost minimisation, innovation, employment, technical progress and sustainability of the firm sector over time (Porter, 1981; Rastoin & Gherzi, 2010).

SCP studies a line of causality that runs from structure through conduct to performance (Church & Ware, 2000). Hence, the original SCP-paradigm assumes a one-way relationship. A number of works demonstrated that this dynamic paradigm needed to be further articulated (specified) with feedback loops between its three main elements, since the outcomes of a firm's (performances) can, in turn, influence both the implementation of strategies and the

characteristics of the original context structure (Porter, 1980; Porter, 1981; Salop, 1979; Schmalensee, 1978; Spence, 1979; Caves et al., 1980; Comanor & Wilson, 1974).

The Conditions-Strategies-Performances framework (Figure 2) goes beyond the previous Structure-Conduct-Performances paradigm since – similarly to the Rastoin and Gherzi variant (2010) - it focuses on the agency capacities of the primary producers and their ability to differently interpret the contextual conditions building on their previous experience and background; furthermore, it does not take into account only the structure of the context in which the primary producers operate, but also involves and adds a larger set of dynamic factors occurring. It also proposes a detailed and extended inventory of potential sets of conditions, considering the intrinsic characteristics of primary producers, their household and firm, including their surrounding biophysical, socioeconomic, institutional and technological contextual factors.¹

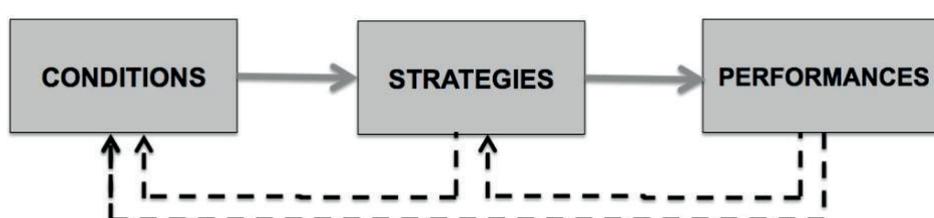


Figure 2. Conditions-Strategies-Performances framework for primary producers from SUFISA project and adapted from Porter, 1981 and Rastoin & Gherzi, 2010.²

Exploring fishing communities in differing contexts

The several and multifaceted socio-economic, political and geographical contexts - that characterise the surrounding factors where fishing activity is conducted - implies a reflexion about the possibility of different analysis through a “fishing community” approach, or territorial, or even through sectoral approaches. In fact “fishing communities” are generally considered as “*mixed economies [...] always changing and evolving*” (Martindale, 2014, p. 297) which imply “*commitment to an industry, not necessarily entailing actually going to sea, but being part of a network of shared interests and concerns that surrounded the fishing*” (Walton, 2000, p.128), and, more specifically, being “*substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew and [...] fish processors that are based in such community.*” (Magnuson-Stevens Fishery Conservation and Management Act, 1996; cited in Clay & Olson, 2007; 2008). However, it is widely acknowledged that fishing activity involves more than landing and processing of catches, including identity and sociocultural aspects also within an urban landscape. Thus, the geographical coexistence and the interactions of the fishing activities with other economic dynamics and sectors do not

¹ A number of studies (Scherer, 1980; De Paula et al. 2003; Carlton & Perloff, 2000; Rastoin & Gherzi, 2010) have modified the original SCP paradigm adding “Basic Conditions” as determinants of the “Structure” - meaning mainly conditions of Supply and Demand – and proposing a Basic Conditions-Structure-Conduct-Performances paradigm.

² For the justification of the feedback loop relationships between Conditions, Strategies and Performances, see Porter (1981, p. 616) and Rastoin & Gherzi (2010, p. 137).

necessarily imply the dependency of the local economies (e.g. in coastal regions) on the fishery sector, since, such communities may have economically evolved, losing or going beyond their original characteristics linked to catching fish (Gallizioli, 2014). Strategies and performances, within fisheries related economic activities, can thus be interpreted differently depending on the entity identified for the analysis.

Fishing communities in Europe have undergone major structural change over the last 20 years, principally through processes of modernisation, concentration and technological development, leading to a reduction of almost 50% of fishing employment (Symes & Phillipson, 2009). Increased technological innovations have allowed fishing fleets to become considerably more mobile and efficient and, along with an increasing demand for fish for human consumption, contributed to the exploitation and overexploitation of 87% of commercial fish stocks (FAO, 2012). These conditions are jeopardising the viability of many smaller fishing communities over time (Symes & Phillipson, 2009), leading fishers and their families to struggle for regular income and to be vulnerable vis-à-vis a number of uncontrollable risks and uncertainties such as changing seasonality trends, severe weather conditions, market volatility and fish stock variability (Doeksen & Symes, 2015). In addition to biophysical and market conditions, the Common Fisheries Policy's management restrictions against overfishing represent another set of pressure conditions for fishers (Symes & Phillipson, 2009).

Evidence of interactions between socioeconomic and biophysical factors within social-ecological systems and the related need for integrated approaches (Berkes & Folke, 1998; Kinzig, 2001; Olsson & Folke, 2001; Olsson, 2003) suggest studying marine fishing as a human activity being an integrated part of ecosystems, connecting the under-sea world and terrestrial coastal communities (Urquhart et al., 2014). Incorporating management and policy issues throughout biological, social and economic dimensions proved to be key in order to achieve sustainable fisheries (FCR, 2000; Forst, 2009).

Anderson et al. (2015) clearly highlighted how a number of studies in the last two decades prove that for achieving sustainable fisheries it is necessary to keep a sustainable stock, together with social acceptability and continuous business investment. In particular, building on a literature review, the authors stress that the important losses of the potential earnings of the fisheries sector at a global level are not only caused by overfishing but also by disproportionate harvesting costs and low efficiency, product waste, and targeting low value markets (Wilén et al., 2005). In fact, although attention and efforts were mostly oriented towards ecological outcomes and fish stock exploitation management (Gutiérrez et al., 2011) - partially overlooking important social and economic outcomes of fisheries (Smith et al., 2010) - several authors demonstrated that marine systems, as social-ecological systems, need both profitable fisheries business activities and acceptance and support for this sector from people involved and participating in them (Dietz et al., 2003; Halpern et al., 2013; Ehrlich et al., 2012). Thus, it remains crucial to identify how fisheries management sustains and influences a range of socioeconomic outcomes, including community wellbeing (Urquhart et al., 2014; Anderson et al., 2015).

In order to ensure long-term viability of fisheries it is becoming evident that there is a need to address the social and cultural aspects of fisheries management (Symes & Phillipson, 2009; Urquhart et al., 2013, 2011; Carrà et al., 2014). In particular, there is a need for new frameworks to assess progress on social-ecological outcomes with respect to the impact of

management strategies on resource, community and market conditions oriented to preserve fish stocks and guarantee socioeconomic community performances (Anderson et al., 2015). Integrating ecological, economic and social dimensions through innovative and structured approaches is then key (Cataudella & Spagnolo, 2011). Furthermore, a comprehensive analysis exploring the potential outcomes of a sustainable management of fisheries, especially for small-scale artisanal fisheries, needs to consider traditional knowledge and the interests of local communities (Potts, 2003), accessing information through a stakeholder approach (Urquhart et al., 2014).

Methodological approach

Derived from industrial organisation and agro-food value-chain management approaches - combined with a literature review at local level - a causal dynamic framework is proposed for analysing conditions, strategies and performances of primary producers of fisheries and aquaculture. This causal dynamic framework is initially applied to two case studies in Europe at NUTS level 2 - Cornwall (UK) and Tuscany (IT) - building on a context-specific literature review to identify the conditions Fishers and Fish Farmers (as primary producers) face and the consequent strategies they are able to develop, as well as the related performances achieved. The "Conditions - Strategies - Performances" (CSP) approach is applied through mapping context-specific conditions, strategies and performances, building on the category inventories identified within the SUFISA project and listed in Appendices 2, 3 and 4.

Findings

The sustainability of fisheries and aquaculture is generally jeopardised by a set of factors shaping conditions such as habitat degradation, over-exploitation of resources, biodiversity loss and transformation, changing consumption patterns, complex and restrictive regulatory frameworks, increasing illegal competition, reduced catches, rising costs, inefficiencies in terms of supply chain organisation, seasonal bans, export and spill-over, market concentration and excessive fragmentation of holdings, illegal, unreported and unregulated fishing (Higgins et al., 2008; Cardinale et al., 2013; Urquhart et al., 2014; Vindigni et al., 2016).

A number of strategies are implemented through the EU's Common Fisheries Policy, however fishers and fish farmers still need to autonomously adapt strategies to cope with both static and dynamic conditions. Response strategies can be found - among several others - in investing for technological innovation, reduction of catches for targeting high-value species, regulating fishing capacity of fleets, training of operators, reorganising and shortening the supply chain, generation renewal, pluriactivity, multifunctionality and income diversification, transforming and processing products for creating added value, participating in labelling programmes, implementing cooperative programmes and supporting sustainable development (Damalas et al., 2015).

At different EU geographical levels, fisheries and aquaculture present a number of sustainability problems that need to be tackled through context-specific analysis. The analysis in this paper is situated in two specific contexts: inshore fisheries in Cornwall in the south west of England and coastal fisheries and aquaculture production in Tuscany, in west-central Italy.

The above illustrated SUFISA variant of the CSP framework was tested through application in the two case studies. Inputs from a literature review at case study level - Cornwall and Tuscany - helped model the causal dynamics shaping the relationships between the conditions that

fishers and fish farmers encounter within their activities, the strategies they implement vis-à-vis specific conditions, and the performances achieved.

Linking Conditions, Strategies and Performances in coastal fisheries and aquaculture in Tuscany

Tuscany is a region in west-central Italy with a population of just above 3.8 million people. The city of Florence is the regional capital. Tuscany has a western coastline on the Ligurian Sea (in the north) and on the Tyrrhenian Sea (in the south), including the Tuscan Archipelago in which the largest island is Elba. The coastline represents an important tourist destination and is varied with mainly extensive sandy beaches and some rugged promontories; three natural protected areas are included in the coastline. The most important port in Tuscany is Livorno, one of the largest Italian and Mediterranean seaports for traffic with a capacity that is capable of handling all kind of vessels.

Fishing activity in Tuscany is spread among 27 ports (European Parliament, 2008) with 600 vessels registered and 1053 active fishermen (FAO, 2015). In 2012 fishing activity from Tuscany represented 8% of total Italian landings (FAO, 2015) and is mainly led through seine (ca. 50%), trawl (ca. 25%), small-scale (ca. 10%) and few passive polyvalent (FAO, 2015). Livorno and Viareggio are the most important fish markets of the region (ISMEA, 2013).

The fisheries sector in Tuscany is characterised also by a considerable production from aquaculture. Coastal capture fisheries and aquaculture are strongly interconnected resource systems and economic activities, presenting evolving and complex dynamics, constrained by several socio-economic, policy and biophysical factors that intervene and alter behavioural dynamics within the production system (Chuenpagdee et al., 2008). Focusing only on aquafarming of saltwater populations and mariculture, the Tuscany production represents 20% ca. of the national production with mainly 12 aquaculture and 4 mariculture coastal installations farming mostly sea bream and sea bass. Although catches of hake and sardine and production of sea bream, sea bass and juveniles are relevant for the Tuscany fisheries sector at a national level, the region is rather an importer of fish and fish products.

Fisheries and coastal aquaculture in Tuscany are both concerned by the critical conditions affecting the Mediterranean Sea. Together with habitat loss, pollution, eutrophication and incidental introduction of alien species, fishing represents one of the strongest stressors that have led to increased changes in the ecosystem structure and loss of fish stocks and marine biodiversity (Coll et al., 2011; Colloca et al., 2011; Farrugio et al., 1993; Papaconstantinou & Farrugio, 2000; Vasilakopoulos et al., 2014; Piroddi et al., 2015).

Building essentially on a context-specific literature review - including government reports at national (Ferretti, 2011; Gilmozzi, 2011; ISMEA, 2013) and regional (ARPAT, 2008; Regione Toscana, 2005) levels - of the fisheries domain in Tuscany (and on the causal dynamic and the categories of conditions-strategies-performances, see Appendix 1, 2, 3, 4) in the last decade it has been observed that *economic crisis* impacted the local fisheries sector through a change in conditions such as *demand* and *price level and volatility*. In particular the demand for fish, together with fish prices, decreased sensitively (Ferretti, 2011), especially at a local level (Tuscany) in 2012 (ISMEA, 2013, p. 23). The reaction of some fishers in Tuscany has been observed through a number of strategies that have been implemented by the primary producers (Table 1):

- This strategic behavioural response can be identified in actions that can be classified in the domain of *rural² development*, in particular with concerns to *diversification and territorial integration*, and then strategies such as *vertical integration* and the shift to short food chains. More specifically, in Tuscany, some fishers developed artisanal activities such as transformation and processing of the catches for the production of fish sauces, cured roe and fillets in oil in order to create added value from the fish products (Ferretti, 2011);
- *Diversification and territorial integration* strategies were also observed in Tuscany through the creation of *new market channels*; for instance small-scale fishers demonstrated a preference for selling to ethical purchasing groups or directly to consumers through a consortium (ISMEA, 2013);
- Other strategies of fishers in Tuscany, vis-à-vis the conditions brought about by the economic crisis (decreasing fish demand and lowering prices), can be identified within the domain of *agro-industrial competitiveness*. In fact, some fishers might further invest in *technological innovation*, such as high tech for management, logistics and mechanisation, or in *intensification and upscaling by internationalising supply and sales market*. For instance, larger-scale semi-industrial fishers tended to invest in innovation, in new vessels, as well as searching for other kinds of consumers beyond the local-scale market channels (ISMEA, 2013).

The *economic crisis* led to a change in the production *factors*, including a considerable increase of the *cost of energy*, in particular higher fuel costs. Fuel represents the main production cost in fisheries activity. This global issue was also observed in a particular time frame (2007-2008) at a local level in Tuscany (ARPAT, 2008) and led to a number of strategies implemented by the primary producers. These strategies mainly belong to the domain of *rural development* strategies (Table 1):

- In particular some strategies consisted of *diversification* techniques, thus the shift to *new food products*; in particular some fishers diversified the catches and changed the gear size in order to target larger size and more valuable fish species. This demanded less time spent on the boat, thus lowering the fuel consumption;
- Other strategies consisted of bringing *multifunctionality* to the fishery activity, in particular through implementing *recreational activities*, such as *tourism* on the boat; this allowed using fuel for both fishery and tourism activities (ARPAT, 2008).

With regards to some *factors* influencing the conditions in which fish farmers conduct their activities in Tuscany, increasing *competition from external markets* has been observed. In fact, the regional sector of aquaculture is affected by competition from both national (extra-regional) and foreign markets (Gilmozzi, 2011). The strategies observed pertain mainly to the domain of *rural development* (Table 1):

² "Rural" is used here to coherently refer to the SUFISA framework and related strategies (see Appendix 3) since this approach implies the integration of principles from rural studies, rural sociology and agricultural economics; however the fishing enterprises can often be situated in an urban environment instead of a rural one. Moreover, fishing communities can be studied using territorial, "area based" and local development approaches (Budzich-Tabor, 2014) and also considering their extension beyond the shoreline into the sea since, according to Clay & Olson (2007), "the places where people fish and where fishing peoples live are not only different in location but also beyond any jurisdictional boundaries of town or county".

- Strategies for responding to the competition from external markets were observed in Tuscany and can be classified as strategies of *diversification and territorial integration* through implementing *quality and sustainability standards*. In particular these strategies build on fostering quality and sustainability of the fish products, in order to apply competitive opportunities, using raw materials respectful of the environmental sustainability through the adoption of internal voluntary quality standards and physical, chemical and biological analysis of the water along the whole fish farming process (Regione Toscana, 2005);
- Other strategies of diversification and territorial integration were adopted through *vertical integration, short food chains* and *local-based networks*; primary producers opted for developing the transformation of processed fish products directly or through a consortium of producers (Gilmozzi, 2011);
- Some fish farmers, within the framework of diversification and territorial integration strategies such as the *development of new food products*, started to catch new and more valuable species, improve and valorise the quality of the products, develop marketing actions, and prepare and preserve fish (Gilmozzi, 2011).

Regulations and policy are also part of the contextual conditions influencing the strategic behaviour of primary producers of aquaculture. In Tuscany, *local and regional development plans* guided public funding for innovation (Gilmozzi, 2011; Regione Toscana, 2005):

- Fish farmers adopted *rural development* strategies and used the public funding to invest in the introduction of new, higher value and strongly demanded species such as brackish water fish, meagre (or salmon-basse) and mussels (Gilmozzi, 2011; Regione Toscana, 2005).

Table 1. Conditions, Strategies and Performances observed for primary producers of fisheries and aquaculture in Tuscany (Italy).³

CONDITIONS FACED	STRATEGIES EMPLOYED	PERFORMANCES EXPECTED ¹
FISHERIES		
DEMAND Price levels and volatility: Economic crisis of the fisheries sector / Lowering demand and prices (Ferretti, 2011; ISMEA, 2013)	RURAL DEVELOPMENT → Diversification and territorial integration - vertical integration - short food chains: Development of artisanal activities, processing new products (Ferretti, 2011) → Diversification and territorial integration New market channels. Vertical integration - short food chains: Small scale fishers prefer selling to ethical purchasing groups or directly to consumers (ISMEA, 2013) AGRO-INDUSTRIAL COMPETITIVENESS → Technological innovation: high tech for management and logistics - High tech for mechanization → Intensification and upscaling: supply and sales markets → Internationalization: Larger-scale semi-industrial fishers invest in innovation, new vessels and look for other kind of consumers beyond the local market channels (ISMEA, 2013).	Business flexibility; Higher revenues; Ethical goals: - New market opportunities; higher sales prices; increasing products attractiveness - Consumers see the products as local Cost reduction; Business flexibility; Higher revenues; Working conditions: - Increasing organisational efficiency
FACTORS Costs for energy: High fuel cost (ARPAT, 2008)	RURAL DEVELOPMENT → Diversification - new food products: Spending less time in the sea targeting larger and more valuable species. → Multifunctionality (Broadening) - recreation activities: Tourism on the boat (ARPAT, 2008).	Cost reduction; Environmental goals; Business flexibility; Higher revenues; Working conditions: - New market opportunities, higher sales prices and greater visibility of the product; lower impact on resources. - Income support; lower impact on resources.
AQUACULTURE		
DEMAND Competition from external markets: The regional market is exposed to the competition of external markets (Regione Toscana, 2005; Gilmozzi, 2011)	RURAL DEVELOPMENT → Diversification and territorial integration - Quality and sustainability standards: Strategies based on the quality and sustainability of the products and production processes (Regione Toscana, 2005). → Diversification and territorial integration. Vertical integration - short food chains - local-based networks: Processing of products with higher added value (Gilmozzi, 2011). → Diversification and territorial integration. New food products: Targeting new and more valuable species, improving the quality of the products, marketing actions, valorisation of the products (Gilmozzi, 2011).	Environmental goals; Business flexibility; Higher revenues; Productivity: - Wider and new market opportunities, higher sales prices; increasing attractiveness of products in view of modern consumers; long-term sustainability and further opportunities for new generations in fisheries activity - Wider and new market opportunities, higher sales prices and greater visibility of the product
REGULATIONS AND POLICY Local and regional development plans: Public funding for innovation (Gilmozzi, 2011; Regione Toscana, 2005).	RURAL DEVELOPMENT → Diversification and territorial integration: Introduction of new and strongly demanded species (Gilmozzi, 2011; Regione Toscana, 2005).	Business flexibility; Higher revenues: - Wider and new market opportunities, higher sales prices and greater visibility of the product

Inshore fisheries in Cornwall

Cornwall forms the westernmost part of the southwest peninsula of the UK. The population of the county is just over 530,000 people, with the city of Truro as its administrative centre. The county is noted for its long and varied coastline, extensive stretches of which are protected as Areas of Outstanding Natural Beauty. The north coast is exposed to the storms of the Atlantic Ocean and is typified by a rugged coastline, although there are also extensive sandy beaches

³ The "performances expected" refer to a list of the potential effects - from specific and strategic actions developed - which were inventoried for the fisheries and aquaculture sectors at national level in Italy (ISMEA, 2013; p.76).

that are important tourist destinations. By contrast, the south coast is more sheltered and there are a number of protected estuaries that have grown up as ports, such as Falmouth, which is the most important port in Cornwall and one of the largest natural harbours in the world. In terms of fish landings and sales, Newlyn is the most important port in Cornwall, followed by Looe. Plymouth, which is just in the neighbouring county to Cornwall, is also important to Cornish-landed fish.

Phillipson and Symes (2015, p. 349) describe how “*Cornwall’s fishing activity is dispersed among some 50 or so ports, harbours and small coves along its long indented coastline with Newlyn hosting the largest concentration and ranked as the UK’s eighth largest port by volume of landings in 2010. With a fleet of 619 registered fishing vessels, of which almost 90 per cent were under 10 m in length, and 898 active fishermen of whom a quarter worked part-time, the sector is diverse and versatile. Fishing activity ranges from beam trawling, scallop dredging, drift netting and long lining, to hand lining, crab and lobster potting. There are two official markets at Newlyn and Looe, though landings at many of the smaller harbours are usually handled by travelling merchants for onward sale or sold direct to local outlets. A high proportion of the Cornish catch is exported to mainland Europe (mainly France and Spain) with little value added locally. Some development of domestic markets has taken place, including several added value initiatives (e.g., hand line caught mackerel, bass and pollack) as well as the supply of high quality fresh fish to high-end restaurants in Cornwall and beyond*”.

Cornwall represents one of the key areas in the UK where inshore fishing remains a key part of the rural community both economically and culturally. Fishermen in Cornwall are facing a range of “wicked problems” that are typically faced by primary producers across Europe such as climate change, globalisation and responding to a post-productivist society involving a wide range of user groups with an interest in coastal areas (Symes et al. 2015).

Building essentially on a literature review (that included: Bush et al., 2013; Cornwall IFCA, 2015; Fearnley-Whittingstall, 2010; Greenpeace & NUTFA, 2012; Harris & Harvey 2012; MMO 2015; Phillipson & Symes, 2015; Reed et al., 2011; Salmi, 2015; Symes & Phillipson 2009; Urquhart et al., 2011) and on the causal dynamic and the categories of conditions-strategies-performances (see Appendix 1, 2, 3, 4), it was possible to identify a set of conditions for the Cornish fisheries sector that necessitated fishers adopting a set of strategies in order sustain their activity (Table 2).

In particular, with regards to the conditions concerning *demand* issues – the inshore fleet faces a lack of control over the market for the prices received, in that most of the fish are sold through the three auction markets (Newlyn, Looe and Plymouth), where the prices fluctuate depending on demand, day by day. The response of some fishers in Cornwall has involved the following strategies:

- Within the framework of *rural development* strategies primary producers have responded through *diversification and territorial integration*, primarily in terms of developing *new market channels & vertical integration*. In particular, fishers in Cornwall, especially the inshore fishers, have developed a variety of different market outlets. These include the harbour markets in Newlyn, Looe and Plymouth, which have the advantage of achieving the best possible price on any given day; some fishers also sell their produce direct to local restaurants, which achieves a higher price but is limited

in terms of the quantities that can be sold; and more recently, modern technologies, including Twitter and Facebook have allowed groups of fishers to publicise their catches in real time and sell direct to London restaurants.

Concerning *regulatory and policy* conditions, the Fisheries Local Action Group (FLAG) in Cornwall has had a part to play in developing *local and regional development plans*, in particular through integrating the local fishing sector into the wider food economy:

- This funding from the EU has been made available to fishers through *rural development* strategies for *diversification and territorial integration*, as well as *quality and sustainability standards*. Investments were made to improve the quality of locally caught fish (such as through providing ice boxes to fishers), as well as through giving the fish a 'story' and a Cornish seafood brand that is associated with traceability and sustainable fishing practices (Reed et al., 2011).

A key condition - from a *regulation and policy* perspective - for primary producers of fisheries is represented by the management restrictions imposed by the Community Fisheries Policy through licensing and quota restrictions, conceived principally in terms of combating overfishing and conserving natural stocks (Symes & Phillipson, 2009):

- Fishers have responded through a number of strategies belonging to *rural development* actions for *diversification and territorial integration*, such as targeting a range of different species (through the deployment of multiple gears). Fishers have also sought to reduce their *risk* exposure by lowering their levels of indebtedness. They also respond by engaging in *pluriactivity* through family members' taking employment that is not related to fishing. In other cases, fishers have responded by adapting their boats so that they can be handled with less people, thereby reducing their crew costs.

Another condition affecting fishing activity is the decline of catches, which is the joint effect of a set of drivers (such as overfishing and consequent restrictions, seasonality, weather etc.):

- One adaptive strategy in response to declining catches - belonging to *agro-industrial competitiveness and intensification* strategies - is to fish further from shore and to spend longer at sea. While this may result in greater income, it also involves potentially more danger as well as spending more time away from the family.

Table 2. Conditions, Strategies and Performances observed for primary producers of fisheries in Cornwall (UK)

CONDITIONS FACED	STRATEGIES EMPLOYED	PERFORMANCES EXPECTED
SMALL-SCALE FISHERIES		
DEMAND Minimal control over prices received	RURAL DEVELOPMENT → Diversification and territorial integration – New market channels & vertical integration: - Developing a variety of different outlets to help even up the prices received	Financial stability: → Improvement of the fishermen cash flow (since buyers pay directly to the fishermen)
REGULATIONS AND POLICY Local and regional development plans: Funding from European Fisheries grant for FLAG (Fisheries Local Action Groups)	RURAL DEVELOPMENT → Diversification and territorial integration - Quality and sustainability standards: - Investments made to improve the quality/qualities of local fish caught. - Giving the fish a 'story' and a Cornish seafood brand that is associated with traceability and sustainable fishing practices.	Environmental goals; Business flexibility; Higher revenues; Productivity: → - Development of gastronomic tourist destination → - Some ports have developed routes into the hospitality trade.
FACTORS Catches decline	AGRO-INDUSTRIAL COMPETITIVENESS - Intensification: - Fishing further from shore and spending longer at sea	→ Higher revenues; - Increase of the income → Working conditions; Increase of the danger for spending longer at the sea. → Household's welfare; Spending more time away from the family
REGULATIONS AND POLICY Common Fisheries Policy: Access to quota	RURAL DEVELOPMENT → Diversification and territorial integration. New food products: - Targeting a range of different species (through the deployment of multiple gears), → RISK MANAGEMENT: - Lowering levels of indebtedness, → PLURIACTIVITY: - Engaging family members' off farm employment, → COPING WITH FISHING QUOTA DECLINE - Downsizing/Survival: - Turning to self-employment and reducing crew size.	→ Business flexibility; Productivity → Business survival → Business survival

Discussion and perspectives

As a preliminary and explorative analysis, the paper investigates causal mechanisms or inference between conditions, strategies and performances observed only through context-specific literature reviews. Hence the operationalisation of the CSP framework proposed in this paper is limited and it is not possible to generalise the results. Moreover, the operationalisation proposed takes into account only the linear consequential dynamics of Conditions-Strategies-Performances and does not study yet the feedbacks that are illustrated in Figure 2. Combining these preliminary findings with insight from media content analysis, primary producers' surveys and participatory focus groups will enable a more robust analysis. In particular, structured retrieval and analysis of knowledge, information and data - through the involvement and participation of producers and stakeholders - will be key, not only to developing an inventory of the different categories of conditions, strategies and performances, but also to identify the dynamic functioning and the direct feedback interactions between those categories.

An additional context-specific literature review of the observed conditions, likely to influence strategies and performance of fishers and fish farmers in Tuscany and fishers in Cornwall, can provide an idea of the necessity to further investigate the potentially related strategies and outcomes for primary producers through participatory approaches. Tables 3 and 4 illustrate a number of categorised conditions, encountered in context-specific literature, that would need to be further explained through the identification and analysis of the related strategies and the outcomes expected.

Table 3. Additional conditions faced by primary producers of fisheries and aquaculture in Tuscany observed through context-specific literature review ^{4,5}

CONDITIONS	Regulations & Policy	Ecological	Finance & Risk	Socio-institutional	Factors	Technological	Demand
FISHERIES							
	- Pressure from nautical tourism ⁴	- Low productivity of demersal species in the Tyrrhenian sea ⁴	- Lack of credit and financial services ⁴	- Illegal fisheries undersize fishes ⁵ - Poor coordination between environment management and production activities ⁵	- Crises of distribution channels ⁴ - Lack of labels of production ⁴	- Old vessels ⁵ - Insufficient landing structures and port services ⁵	- Competition between industrial fisheries and artisanal fisheries ⁴
AQUACULTURE							
	- Urban and environmental restrictions limiting the aquaculture activity ⁴	- Damages from piscivorous birds ⁴	- High costs for starting a firm ⁴	- Overly bureaucratic processes and management ⁴	- Increase of costs for fish meal ⁴		- Prejudgement of consumers for aquaculture fish instead of wild fish ⁴ - Strong competition from cheaper Mediterranean fish products ⁴ - Lack of information of consumers concerning areas of origin of fish ⁴

Table 4. Additional conditions faced by primary producers of fisheries in Cornwall observed through context-specific literature review

CONDITIONS	Regulations & Policy	Ecological	Finance & Risk	Socio-institutional	Factors	Technological	Demand	Socio-demographic
SMALL SCALE FISHERIES								
	- Access to quota - Introduction of the Landing Obligation and Discard Ban	- Intensive use of the local ecosystem - Multiple demands of the local ecosystem - Water quality - Seasonality - Weather	- Lack of capital to buy boats, in part because of quota uncertainty	- Some lack of communication between fishers and managing institutions	- Depleted stocks - Lack of sufficient quota - Rising production costs - Pressure of tourism and recreation sectors	- Accurate assessment of local fish stocks, which fluctuate considerably	- Fluctuating prices - Market instability - Low consumer awareness about fish - In general, a lack of fish eating culture in the UK	- Recruitment problems - Ageing of fishers - Increasing housing prices for younger fisher households - The inheritance route into fishing is less common

The competing interests and concerns among stakeholders and actors involved in a fishing community, in a fishing area, or in the fisheries industry, represent further issues that will deserve additional study at local levels.

Competition between actors in fisheries can have negative impacts on income and wealth distribution particularly for small-scale fisheries and traditional fishing modes, especially when fish and seafood imports increase, leading to stronger price pressures (Crona et al., 2016). Often a dualism emerges between small and large-scale fisheries, competing for the same limited fishing resources and markets, and differing in the scale of the activity, the degree of

⁴ Ferretti (2011)

⁵ Regione Toscana (2005)

capital intensity and investment, the technology used and employment generation. However, even if there are fixed thresholds at a national or European programme level to define the scale of fisheries (vessel length, KW, GT), there are not clear boundaries that limit the field of activity among the different sectors (artisanal, industrial etc.) of the fishery operations. Also, the different fisheries sectors can respond (or adapt) to diverse pressures (fuel price increase, lowering subsidies etc.), differently depending on the surrounding economic and specific context (Carvalho et al., 2011).

With regards to other competing concerns within actors that will deserve additional study - in particular for the environmental issues related to fisheries - it is acknowledged that the loss of freshwater fish is also caused by acidic precipitation, changes in global precipitation patterns, and air and freshwater pollution (Rockstrom, 2009). Actors and stakeholders, from fishermen to environmental non-governmental organisations, play an important role through initiatives aimed at influencing pollution control policies.

Conclusions

Research on fisheries management has been mainly characterised by biophysical approaches and recently several efforts have been implemented to integrate socioeconomic and cultural issues with environmental aspects into fisheries research. However, for many geographical areas, there is a call for developing further research on sustainable fisheries management through participatory approaches in order to explore the crucial issues involved in decision-making and to identify strategic sustainable solutions (Carrà et al., 2014). It is widely acknowledged that moving fisheries towards a more sustainable management perspective needs further analysis of the social dimensions of sustainability (Acott et al., 2016).

Thus efforts are increasingly being focused on the integration of local knowledge and social values into decision-making frameworks for identifying sustainable strategies for fisheries through balancing the environmental, economic, socio/cultural elements and the related inter-linkages; qualitative data will then be used together with quantitative data (Acott et al., 2016). For instance, incorporation of historical information (i.e. Local Ecological Knowledge and Traditional Ecological Knowledge) about fishing practices or the observed trends of fish stocks, is considered key to implement plans and develop new strategies for fisheries' primary producers such as identifying new fishing grounds, innovative fishing tactics and targeting different species for new markets (Damalas et al., 2015). The analysis of the information brought from the media, together with interviews with stakeholders and participatory focus-groups can then contribute to a suitable, more informed and systemic application of this framework, avoiding an excessive reductionist approach and allowing a systemic perspective.

Derived from industrial organisation and agro-food value-chain management approaches - combined with an extended literature review (integrating principles from rural studies, rural sociology and agricultural economics), a retrieval of available data, and structured knowledge-based tools and participatory elicitation techniques - a transdisciplinary research process is proposed for analysing and modelling conditions, strategies and performances of primary producers of fisheries and aquaculture in Europe. Engaging with stakeholders and experts, through integrated and structured knowledge-based tools and accessing qualitative and quantitative information, will be key to comprehensively analyse how primary producers develop decision-making processes (Eriksson et al., 2016) when they are exposed - and thus

potentially vulnerable - to specific stressors and changing conditions, calling for transformation strategies towards sustainable solutions and performances for fisheries and aquaculture.

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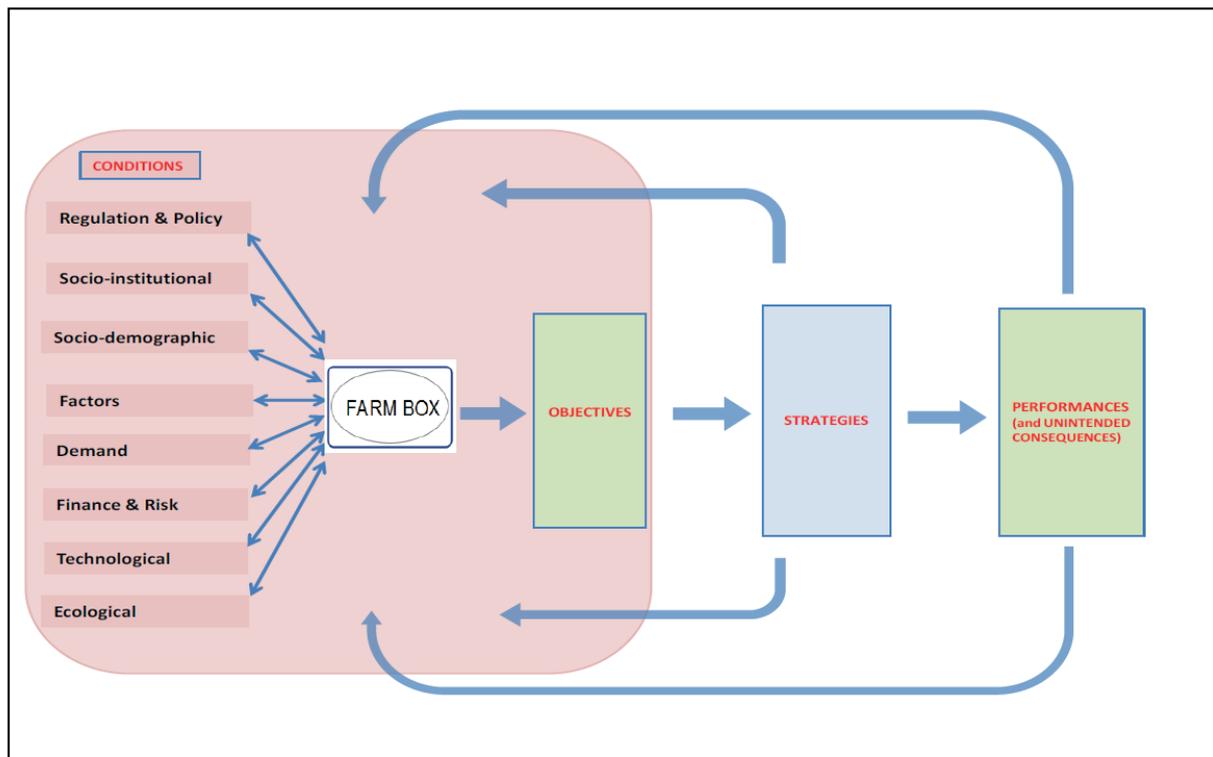
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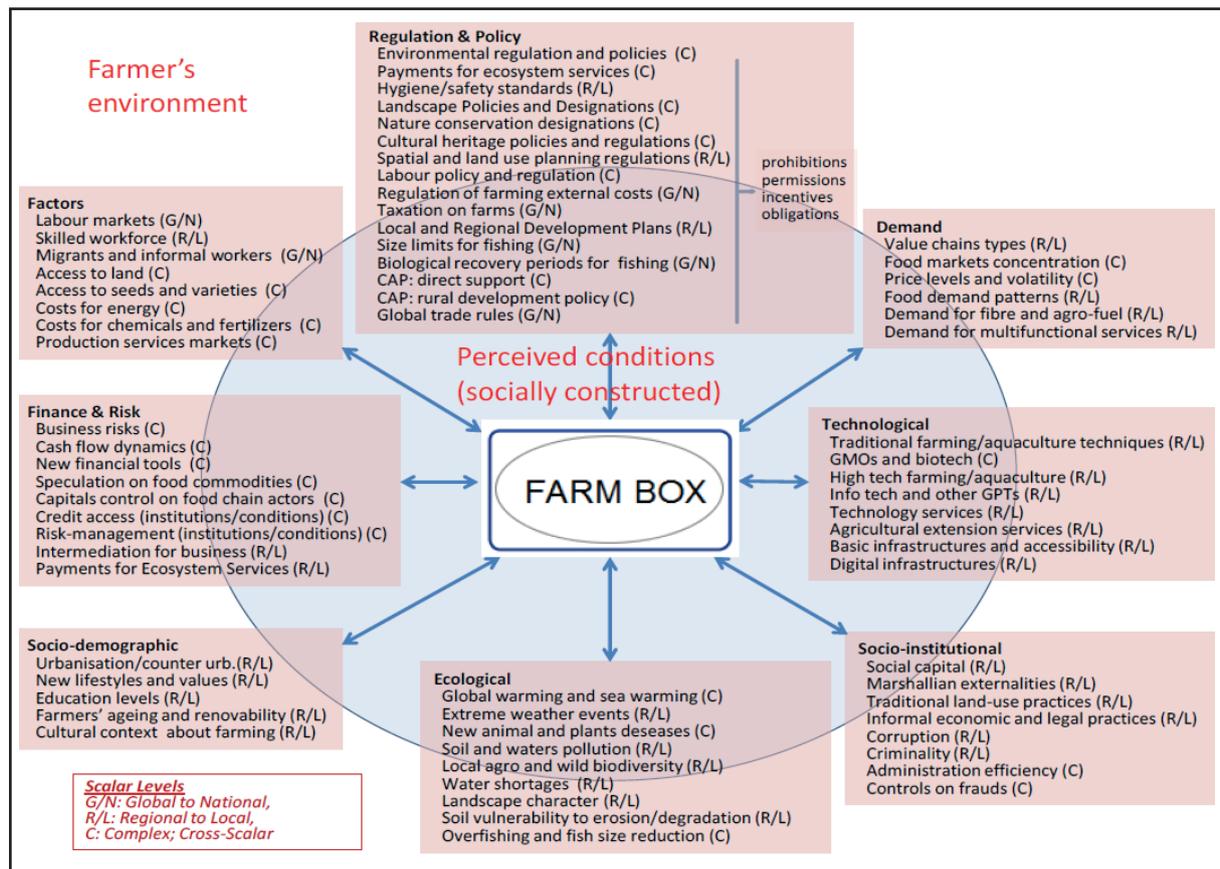
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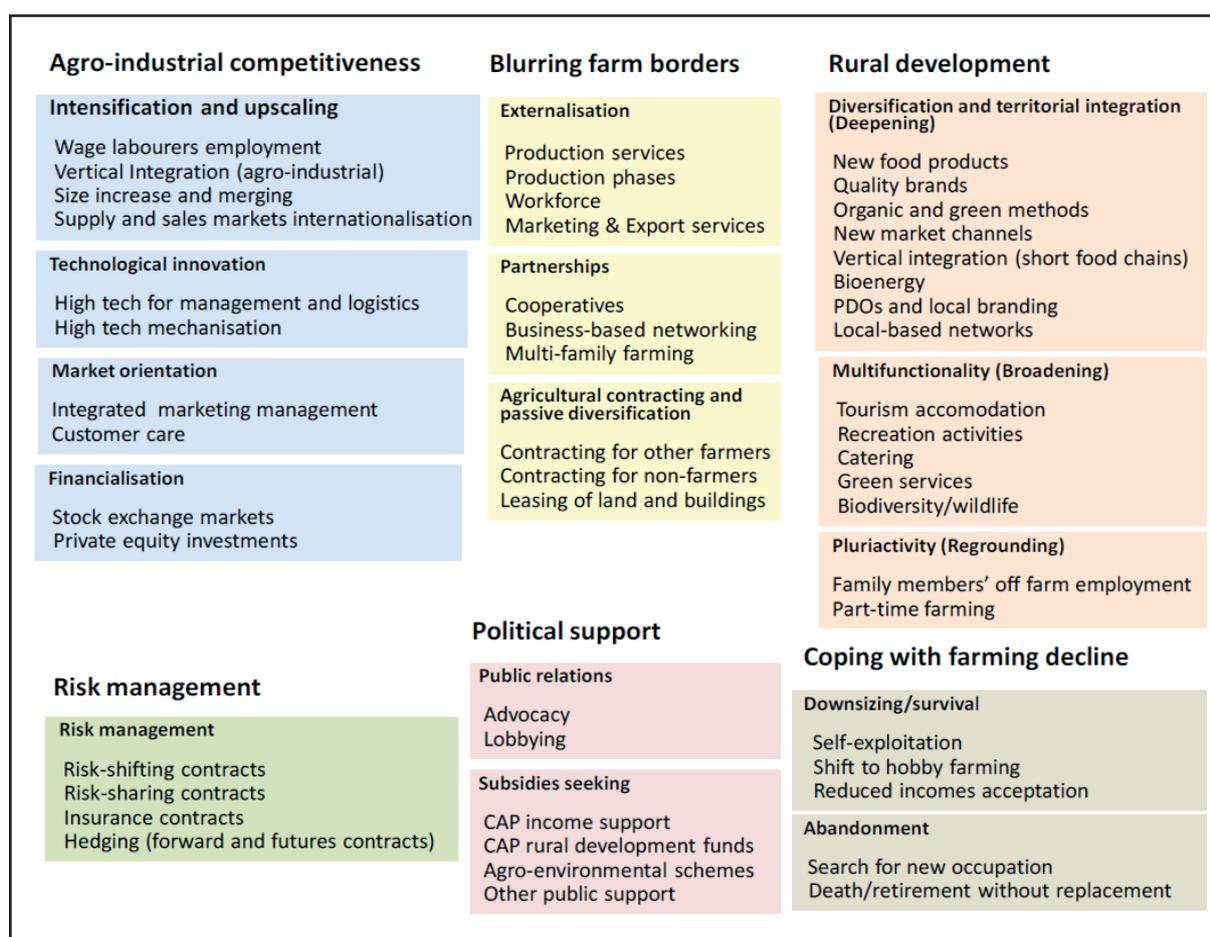
Appendix 1. SUFISA Conceptual Framework “conditions, strategies, performances and feedbacks”



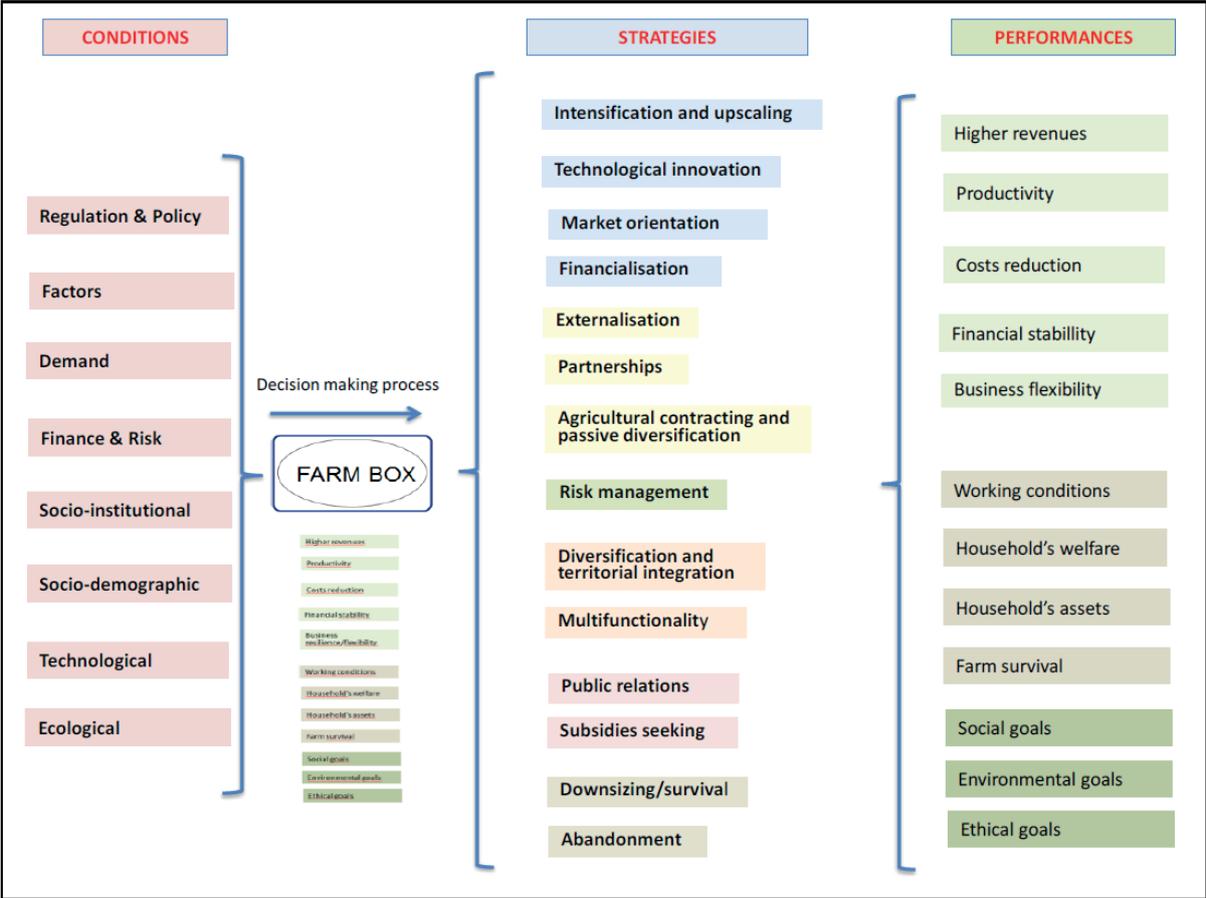
Appendix 2. Farmers' environment and perceived conditions



Appendix 3. Farms' strategies map



Appendix 4. Conditions, Strategies, Performances



Risky business - a genealogy of the financial discourse in Danish agriculture

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Abstract: Currently Danish farming is in a financial crisis, as Danish farmers have adopted a mode of agriculture which is dominated by high investments, high debt and high risk exposure compared with other countries in Europe. In our paper we conduct a discourse analysis exploring the Danish mode of farming, focusing on the development in the past 250 years. In the paper we identify one diagram for Danish farming, characterised by 7 implicit norms: (1) Farming is the backbone of society; (2) Self-ownership is a superior organisational form; (3) Agricultural policies should be based on liberal ideas; (4) Unity makes stronger; (5) Agriculture should be oriented at export markets; (6) Agriculture should be science based; and (7) Standing still is going back. Furthermore, we identify three discourses that are concrete manifestations of this diagram. 1) **Family farming** which is characterised by understanding farming as a nation building project, institutionalised as an individual and export oriented activity, enabled by collective organisation. 2) **Welfare state farming** characterised as a social contract giving access to subsidies. Productivity comes to be seen as the guarantee for peace and security, which justifies economies of scale, mechanisation and specialisation. 3) **Industrial farming** emerges as farmers embrace growth as the fundamental condition of the farming. Several mechanisms have worked to subjectivate farmers as financial farmers, such as the introduction of tradable milk quotas, harmony regulation and a reconfiguration of the public subsidies from production support to direct payments and a volatile commodity market.

Keywords: Discourse analysis, Danish mode of farming, family farming, welfare state farming, industrial farming

Introduction

On an average week in 2015 five Danish farmers would experience bankruptcy. The extent of bankruptcies has reached a level justifying a description of Danish agriculture as being in the midst of a financial and economic crisis. Currently it is estimated that as many as 30% of all farms operate with both a high debt and a deficit and thus struggle to achieve a sufficient rate of profitability. The total debt of Danish farmers today amounted to 370 billion DDK (~€50 billion), which is the highest debt per farmer in the EU. A recent report from Copenhagen University's department of Food and Resource Economy has highlighted this debt as the main cause of the income problem experienced by Danish farmers in comparison with other European farmers (Asmild et al., 2015).

Contemporary observers have argued that the financial situation in Danish farming is the result of a strategy which is dominated by high investments, high debt and high risk exposure

(Kjeldsen-Kragh 2010; Hansen & Zobbe, 2012; Kyed et al., 2012; Jakobsen, 2013). Though, prior to the current crises, other observers have argued that Danish agriculture has not developed solely as a result of market mechanisms, various political interventions based on particular perceptions of what agriculture is and ought to be have also influenced how the market mechanisms function (Ingemann, 1997). It thus seems implausible to assume that the current crises can be understood as nothing but the inevitable outcome of an international market situation. Hence, contemporary Danish farming has evolved into what commentators have labelled a “risky business”, but the question is how this strategy has emerged as the most obvious solution in the view of the majority of Danish farmers.

In this article we explore the Danish agricultural history by making a genealogy of the financial discourse within Danish agriculture in an attempt to understand how Danish agriculture ended up in the current financial crisis. Discourses provide justification for actions such as economic behaviour and our ambition here is to excavate the forms of thinking that have characterised Danish agriculture for the past 250 years. It is our assertion that the financial discourse within Danish agriculture can be said to follow a specific diagram. According to Michel Foucault a diagram is “*a mechanism of power reduced to its ideal form; it’s functioning, abstracted from any obstacle, resistance or friction*”, working as an abstract machine that gives rise to particular concrete assemblages of power (Foucault, 1975/1977). Furthermore, we identify three different discourses in which a new interpretation and implementation of the diagram has been adopted.

Discourse analysis

Our analytical approach is based upon the thinking of French philosopher Michel Foucault. From his works we draw two different analytical strategies.

As we are interested in understanding how the current financial situation in Danish farming could emerge we begin by excavating the ideal form of farming as it has appeared in Denmark for more than two hundred years. Our outset is to approach the issue of finance in farming as an issue of specific modes of thinking. Danish farming is characterised by a high degree of homogeneity when it comes to the underlying rationales guiding decision making. We therefore aim at understanding these rationales and describing how they structure the thinking displayed in the agricultural sector in Denmark. Following Foucault, such rationales can be considered as a diagram. A diagram is a *mechanism of power reduced to its ideal form* (Foucault, 1975/1977). The diagram designates an ideal state of affairs in which human interaction takes place, the line of thinking that under (ideal) conditions would produce the perfect desired state of affairs. In *Discipline and Punish* (1975/1977) Foucault provides an example of a diagram in Bentham’s design of the panopticon. The ideal formation of the diagram finds a number of never perfect expressions in programmes. The programmes referring to the ideal of the panopticon find their concrete form in the many institutions (prisons, offices etc.) that emerge and which are designed to implement the steering rationality of the panopticon.

In the current context programmes might emerge in agricultural regulations, the farm layout, credit policies, farm school curricula, focus of research programmes etc. as these institutions all operate with a particular notion of the ideal farm. Furthermore, the institutions function as “future generating devices” that structure decision-making and afford the proliferation of a

particular mode of agriculture. To explore the Danish farming diagram our analytical approach is discourse analysis; it is an analysis that draws attention to the self-evident rights and wrongs of a given period which reflects the diagram of the ideal form of farming. When we cast our analytical focus on a discourse we then place language at the centre of our focus. According to Foucault, a discourse formation is a regularity between a group of verbal performances, statements and signs (Foucault, 1969/1972). When we embark upon describing a discourse it is the statements of the period we turn our attention towards, because a sequence of statements shows how a specific performance appears that in turn allows the individual statement to appear as meaningful.

This approach is useful because language is not a neutral reflection of the world; instead Foucault shows how the world is brought into the human sphere by language (Foucault, 1966/2002). The world exists only as a result of our capabilities for bringing it forth. For instance Foucault has shown how the old distinction between madness and sanity became replaced by a differentiation of madness culminating with the idea of psychiatric diagnosis, a development that occurs as each period begins to question the present abilities to fully capture the 'true nature' of the deviant (Foucault, 1961/1988). This implies that the progress of human knowledge is not a gradual enlightenment, but rather a history of different light replacing other light. As a consequence our intention is not to cast a judgement over particular regimes of knowledge, rather our ambition is to analyse how a given discourse provides structure to the knowledge and gives meaning to decisions made within the period in question.

As mentioned, Foucault emphasises that history does not progress in a linear fashion. What characterises history is therefore shifts rather than progression. The discourses we wish to analyse provide good examples of how a shift in the thinking of a given period generates the take-off of a new period. Furthermore, the defining feature of a Foucauldian discourse analysis is an explicit focus on the configuration of power relationships. Hence, discourses do not act directly on our conduct, but they are a mode of action that guide the possibility of our conduct and order the possible outcomes (Foucault, 1982). This notion of power departs from a concrete and physical form of oppression; rather power is seen as an abstract, a construction of reality focusing on particular capabilities of the subjects. Hence, power grows from within as an omnipresent sphere of "force relations" that conditions the actions of individuals that are essentially "free" (Foucault, 1990). Thus, power does not have a visible face or a clear origin and therefore it is not something which can be possessed, but it is a process whereby certain outcomes gain preference over others.

To develop the analysis we have initially compiled an archive of different sources of information that characterise the development of Danish farming. Our analytical approach consists of tracing the different lines running through this archive.

The archive consists of: 1) Statistical data that characterise the structural development and financial situation of Danish agriculture from around 1800 onwards; 2) Historical accounts of the changes in agricultural structure and policy; 3) Gathered together the various regulatory reforms that have taken place in the past 200 years, background notes, commission reports etc; and 3) a record (1870 - today) of the Danish journal, agricultural economics (Tidsskrift for Landøkonomi) and an index of the articles. The journal is not a traditional peer reviewed scientific journal, but it is a journal written by both scholars and practitioners for the agricultural

and academic communities. Hence, the contents of the journal reflect the communication between the academic and the agricultural community concerning various aspects of farming - practical, political, technological and financial. Historically the journal has been an influential communication medium and it gives a broad perspective on how the agricultural community has seen itself and reacted to external threats. To explore the development in the discourse of finance in agriculture initially we formed an overview of the archive. We have analysed how the farming discourse has evolved by focusing on the major changes in policy, technology and markets that have influenced the course of agricultural development, exploring how these changes have been interpreted by farmers, policymakers and researchers.

Results

This section will initially introduce the diagram of Danish farming and afterwards we will present three discourses which have dominated Danish farming for the past 250 years.

The diagram of Danish farming

Danish farming has undergone significant structural development during the past 250 years, however, not only the mode of thinking and logic that dominates Danish farming but also the history display a remarkable stability. The diagram of Danish farming is conceived in a number of rural reforms that took place in the late 18th century, most significantly the great rural reform of 1788, which contained an abolishment of serfhood (Stavnsbåndets ophævelse). Originally serfhood was implemented in order to keep that part of the rural population who did not own their own farms available as a labour force to the nobility and to the rural militia.

In the mid-18th century a new perception on land ownership, farmers, and agricultural production begins to emerge. At the time the land was owned by large estates, however, about 90% of the land was farmed by serfs, and much of this land was common land shared by villagers. The agricultural market in Europe expanded and the king (Christian the 7th) wanted to “*improve the rural conditions and their usefulness*”, based on a north German model. Furthermore estate owners had been complaining to the king about lazy and unwilling peasants (Bjørn, 1988). This understanding of agriculture shows a clear difference to previous forms by stressing the value of income from the land rather than owning as much land as possible. This change led to a large scale reorganisation of the farmland and relocation of the farms which took place from 1760 onwards. The result was splitting up the common land into individual parcels and moving many of the farms from the villages onto the newly allocated and individually owned parcels. The reorganisation also encouraged the estate owners to transfer ownership to the serfs, or base their serf contracts on inheritance, as “*nothing is more effective in giving the peasant courage and something to strive for, than a security that the energy and resources he applies to improve his farm, shall benefit him and his kin*” (Bjørn, 1988 p. 316).

The rural reform also initiated a completely new mode of agriculture and ownership. Most importantly agriculture was individualised. Collective land was redistributed and farms which had previously been integrated into the villages were relocated placing each farm onto its newly allocated individual plot of land. Thus, farmers were now subjectivated by the large scale introduction of self-ownership, which has since become an important institution in Danish agriculture. Interestingly, this transition was largely enabled by the emergence of credit funds

and estate owners who were interested in releasing their liquid funds. However, the process was slow and only a gradual transition.

Although agriculture has developed significantly, the underlying logic behind agriculture which was conceived with the rural reform has remained relatively unchanged and it is characterised by a mode of thinking that can be summarised in the following 7 implicit normative foundations:

1. **Farming is the backbone of society.** Physiocracy was the main ideological driver of the rural reforms in the late 18th century, emphasising agriculture as the source of national wealth. In the following century this notion particularly gained traction, as farmland is the only Danish natural resource and following major reductions in national territory in 1814 (Norwegian independence), 1864 (Schleswig and Holstein included in the German union).
2. **Self-ownership is a superior organisational form.** Private ownership is seen as the ideal ownership form as it motivates the individual to make an additional effort. Loans and the evolution of a credit system are adopted as a means of attaining self-ownership, hence, debt at a fairly early stage in modern history becomes seen as a natural aspect of becoming a farmer.
3. **Agricultural policies should be based on liberal ideas.** Liberal ideas of the benefits of free markets and individual freedom are adopted as important ideals by farmers. This liberal mind-set is inherently also characterised by a paradox between on the one hand stressing the need for individual freedom and entrepreneurship as the source of wealth creation and on the other an ideal of providing equal opportunities for all. This paradox plays out in various ways continuously throughout the Danish agricultural history.
4. **Unity makes stronger.** In the late 19th century cooperative organisation is put in place to allow Danish farmers to rationalise their productions and compete in foreign markets.
5. **Agriculture should be oriented at export markets.** From an early stage Danish agriculture is conceived as an export industry and Danish agriculture has strived to meet and fulfil the demands of the world market.
6. **Agriculture should be science based.** Since the beginning of the 19th century science is seen as the best means of optimising agriculture and the ideal for agriculture is an evidence based practice.
7. **Standing still is going back.** It is necessary to safeguard against crises by constantly optimising the farming system and making “sound” investments.

The diagram cannot be perceived as 7 isolated norms, but they constitute a fundamental and overarching world view, that would permeate all rural life and financial activity, by being expressed in a number of important institutions. Although these seven maxims have been important ideals for Danish farming for the past 200 years we identify three different periods that are characterised by different interpretations and implementations of the general diagram.

The family farm

The family farming discourse was conceived at the time when rupture from the rural reform was slowly settling and the diagram manifested itself in a particular mode of production and discursive sense making. The new discourse that emerged throughout the second half of the

18th century established a regime of knowledge in which the efforts of the hardworking individual farmer came to be seen as the cornerstone of the agriculture portion.

By 1860 the majority of farm land had been transformed to freehold and by this time the agricultural industry was the most prominent in the country, reflected in the fact that the only export commodities were agricultural products. The disastrous grain prices in the 1860's and 1870's had a very hard impact on the agricultural industry and society at large, subsequently Danish agriculture began a transition to animal based production, in particular, dairy, beef and pork for the English and German markets and from 1860's onwards the animal based agricultural export was around 90% of the total Danish export. Farming at the time is highly influenced by the ideals of liberalism as noted by one of the prominent commentators of the time, the national economist V. Falbe-Hansen in 1886: *"For agriculture as such, there is no danger, even though the lower prices that we have seen in the later years should remain (...) A decrease in the farm prices would destroy many farmers, but not agriculture, it would not weaken agricultures sources of wealth either"* (FalbeHansen, 1886). The liberal economic ideas were well aligned with the Danish (and English) free trade policy, however, other European countries responded to the crisis by adopting a protectionist policy imposing import taxes on foreign produce, which proved a challenge for Danish farmers (e.g. Germany, France and Austria-Hungary). The transition to animal based production in the 1860's is noteworthy because Danish farmers adopted a new mode of production at a fairly early stage compared with other countries in Europe. In a relatively short period Denmark went from being a net grain exporter to a net importer and exporter of dairy products, in particular butter and cured pork (Henriksen et al., 2012). The cooperative organisation also assisted in a rapid transition, for instance in 1888 alone more than 200 new cooperative dairies were established (Hansen et al., 1934).

Cooperative organisation is not a particular Danish phenomenon, but the configuration and extent to which it permeated all business life is a significant Danish feature. The cooperative movement is a defining feature of family farming because it enabled small-scale and diverse farming to be economically sustainable (Henriksen et al., 2012). Cooperating was not just a practical matter for lifting the task of serving the export market; it also came to be seen as a social obligation. Hence the debating culture and consensual decision-making which is characteristic of the Danish cooperative organisation has been an important factor in shaping a very homogeneous farming sector and farming identity. However, cooperative organisation is only applied to processing and supply industry and various other institutions, it has never been applied to the organisation of the farm. Hence, there is a strong distinction between how different forms of ownership are applied, the farm is owned and operated by an individual and other institutions are owned and operated in collaboration.

Farmers' access to capital is also an important factor that enables the implementation of the new mode of agriculture. Initially small cooperative banks were started to enable farmers to save a little income, but the transition to freehold, investments in farming equipment and technology, gradually implied an increasing demand for capital in the 18th century (Bjørn, 1988). Initially loans were given to associations in joint liability and several purchases were made in this way, but the idea that the industrious farmer would be oppressed by incompetent colleagues eventually led to individual liability (Hansen et al., 1934). In particular, many of the big estates had a strong interest in making capital available as good capital access would also

encourage high land prices. Hence, from the end of the 1840s saving banks were founded and used by farmers to obtain short-term loans for small improvements or getting through a poor harvest, whereas the emergence of mortgage providers, enabled long-term investments with the security of fixed interest rates. The development is illustrated by the number of rural saving banks and the loans they provide; in 1848 there were 36 such banks providing loans for a total of 16 million DDK, but by 1879 this had risen to 446 providing loans for 254 million DDK (Hansen et al., 1934). The outgrowth of these new capital providers transferred the configuration of investment capital from a personal loan (often from an employer) to a more systemic form of loans in which the new banking institutions played an important role. The technological advancements coupled with the access to capital, enabled the outgrowth of specific trades that specialised in the production of farming machinery such as foundries (Hansen et al., 1934). Hence, gradually the farming activities are decoupled from other activities, which also transforms the farmer from relying on the help of village neighbours concerning the jobs that cannot be fulfilled by the farms' personnel to an economic agent that purchases services from the local community.

In a debate concerning the effects of a commodity price crisis, Edward Tesdorf, one of the central figures in rural economic debates in the mid 19-century, notes that a major concern for the current agricultural system is the farmers who would rather "*invest in safe stock bonds than in developing their own enterprises*". The statement is noteworthy because it highlights the importance of virtues such as putting oneself at risk, "sound" investments, and confidence in one's own industrious abilities, for the development of modern farming.

From around 1830 onwards farmers gradually began a largescale reshaping of the landscape that would eventually last more than a hundred years and enable a more rational agricultural practice. The rural areas contained a vast amount of small waterholes, bogs and scrubs and the like. These "*unproductive and useless*" areas were increasingly drained or cleared and included in the production area. Furthermore, the agricultural sector benefited from a growing population that supplied the additional labour force needed to actively change the rural landscape. These projects gained an additional importance following the Danish defeat in the 1864 war with Germany. On the Danish side the result was a loss of nearly one third of the Danish territory, including some of the most fertile land, and close to half of the population. Following this defeat the cultivation of what had previously been seen as unfertile wasteland was now seen as a national obligation. The projects motto was coined in one phrase by one of its most important figures, Enrigo Dalgas, who said "*what is lost externally must be gained internally*". Thus, "*land gains*" left an important imprint on the physical landscape, and coupled the farming activity with national identity building at a time when the nation was threatened. This process has left a remarkable imprint with the Danish farming identity, that sees farming as the backbone of Denmark; that which enabled the country to rise and regain its power following the humiliating defeat.

In the middle of the 19-century science increasingly began to influence the organisation of agriculture and affect the perception of farming as a rational and scientific undertaking. Several inventions, both technical (steam powered tractors), veterinarian (hygiene, breeding programmes) and chemical (artificial fertiliser) assisted the transition to modern rational agriculture. The applications of these new technologies were taught to young farmers in farm schools across the land. The strong collaboration that was established between the state,

research institutions and farmers formed an important factor in the institutionalisation of rationalisation in Danish farming. Modern farming was increasingly seen as a scientific undertaking and the scientific ideals and approach were translated into all aspects of farming including the curricula at the farming schools. One of the important factors that derived from this scientification was the institutionalisation of a calculative mind set, as accounting was seen as an important rational principle. One of the agricultural school professors, S.C.A. Tuxen, for instance noted that young farmers need to account "*under such a form that the business sense that characterises contemporary farming is quietly imprinted, in such a way that character of the despised double book keeping is imperceptibly embedded as something completely natural*" (Quoted in Hansen et al., 1934).

The outbreak of the World War I marked the ending of a 40 year period of progress and prosperity for Danish agriculture. The Danish government pragmatically decided that Denmark would support either of the conflicting parties and suddenly Danish agriculture found itself in a predicament, the liberal spirit that had dominated the agricultural market before the war had suddenly faded (Bjørn & Pedersen, 1988). During the war Danish agriculture was heavily regulated and supplied each market in an elaborate and carefully coordinated agreement and meanwhile also supplied the Danish own market at a secured "low" price (Bjørn & Pedersen, 1988). In the aftermath of the war the agricultural industry expected a rapid return to the former liberal policy regime, high and stable prices. However, commodity prices were still fairly low in the 1920's. Furthermore, the period was characterised by a very high unemployment rate (~30%), and the great depression following the Wall Street crash in 1929 resulted in poor world market prices, economic depression in England and Germany and increasing protectionism in the export markets of Germany, England and France.

Summing up

Within the family farming discourse the purpose of production is seen as the survival and preservation of the farming family. The transition to freehold institutionalises credit and finance as a natural foundation for agriculture. Furthermore, investments by industrious entrepreneurs are considered as important elements in securing a development of the farming industry. Self-sufficiency is important both in the discursive construction of farming and as a practical measure to ensure the survival of the farm, hence farming is ultimately about care, cultural preservation and family life. Although there are some farms that employ outside labour, the entire family, including wife and children, participate in the farming activities and usually the farm is transferred from father to son. Since the institutionalisation and the abolition of serfhood this generational perspective had been an important aspect of farming. The father knew that one of his sons would inherit the farm and it was his ambition to improve the conditions. Included in this generational perspective is also the expectation that the son will provide for the older generations when they are no longer capable of this themselves. Therefore, time is unimportant because changes are slow and predictable.

Welfare state farming

When WWII ended Danish agriculture experienced another shift. Many European countries were left in ruins and needed to be rebuilt. At the same time the cold war was in its emerging phase and the western European nation states also had to ensure their future stability and security, strongly supported by the United States.

Developing agriculture by increasing productivity is a central objective of the agricultural policies in the post war period. For instance, the objective with the regulation of agricultural had changed, strongly encouraged by the European Relief Programme (ERP) that encouraged an *“expansion of the productivity in all the participating nations, particularly with regards to agriculture (...) and mechanisation of machinery and tools”* (1948: 288). Hence, in the post WWII period the development of agricultural productivity was coupled with security and cooperative policy of the European nation states. Furthermore, increasing productivity was seen as one of the most important aspects in securing peaceful coexistence, because the European nations experience food shortages. Hence, the post war period marked a new transition for Danish agriculture based on the virtues of rationalisation, mechanisation and industrialisation, as noted by one of the commentators in the Journal of Rural Economy, agricultural school principal Johannes Ridder: *“Rational essentially means sensible and logical; to farm rational is (...) to base production on logical realisation and sound argumentation and I add: calculations – rather than following the habitual or handed down experiences”* (Ridder, 1948). For a number of years Danish farming had been in conflict with the industry, and the apparent resolution to this conflict was to reinterpret farming as a form of industrial production.

But the developments in Danish agriculture had already been prepared in national changes that took place prior to WWII. A significant milestone in Danish agri-environmental regulation is a political compromise, which was later known as “Kanslergade forliget” in 1933. It is important because it was developed among the political parties supported by the farmers and the labour party. At the time the agricultural sector and the industrial sector had opposing interests. The compromise was an important feature as there was a growing frustration within the agricultural community that the sector was slowly losing its position as the only export producer. It was a significant milestone in managing the growing conflict between agriculture and the industry. In the compromise the government would devalue the Danish currency to secure higher commodity prices, tax relief, lower interest rates and land partitioning for the peasants. For their part the labour party ensured the collective agreement and a social security reform. Henceforth, production was effectively coordinated by the agricultural ministry and production purchased at agreed prices and transferred to particular export partners. Hitherto agriculture had been the only producer that was considered in Danish politics, but the compromise heralded a new area as agriculture accepted the industry as an equal partner. The new identity can be characterised as a social contract, in a Keynesian sense, between society at large and agriculture, in which agriculture embraces the role of “job creator” by gaining indirect public support in the form of a more favourable financial policy. Hence, the compromise also marks an important reconfiguration of the liberal ideology from the national financial policy to other aspects of farming and social life. Thereby the industry is able to access a form of public support without compromising its liberal foundations.

At this time in the 1930's and 1940's there were around 200,000 individual farms and agricultural products were still by far the most important export commodity, as industrialisation had not caught on in Denmark to the same extent as in other European countries. During WWII Danish farmers once again experienced problems with input supply and commodity export, which were solved with an export ban and a fixed price structure. Hence, in the 20 year period between 1930 and 1950 the agricultural sector largely relied on politically agreed prices.

In the 1950-60's Denmark was industrialised and the industry attracted a large number of rural workers by offering higher wages, fixed working hours, holidays and weekends off. This labour competition was an important aspect in the shift towards mechanisation. "*When there is so much debate about the rationalisation of agricultural labour through mechanisation, then it is in the expectation that by making an effort you would ease the impacts of a dwindling working force*"(Hansen, 1946). Mechanisation resulted in a production increase during the 1950's and early 1960's in many European countries, and therefore also decreasing prices. The transition from manual labour also changed the farmers perspective on his farm, it was no longer just a farm, but a production system and increasingly the farmers embraced an identity as industrialists, best exemplified by the estate owner Flemming Juncker, who envisioned a future for a thoroughly mechanised Danish agriculture, in stables and in the fields – *a poets creation* (Juncker, 1948). The result was a reconfiguration of agriculture that implied the substitution of manual labour for machines, petroleum, pesticides and fertiliser. Hence, mechanisation largely relieved the agricultural sector of its role as socio-economic provider and fundamentally changed the role and identity of the farmer. Although mechanisation at the time was seen as a "*comfortable novelty*", that was necessary for attracting labour to the farms, it fundamentally changed the rural culture by releasing a number of people from agricultural work and thereby reconfiguring the rural communities when they went to live in the cities.

Investments in machinery were legitimised by the discursive shift towards welfare state farming. Machines fundamentally changed farming from a social activity, involving the whole family as well as farm labourers to now being an individual activity, carried out only by the farmer and his machinery. In practice, mechanisation implied that the farmer was able to cover a much larger plot of land on his own which legitimised a significant structural development. Furthermore, small-scale and diverse farms were no longer considered economically viable and some of these sold off their lands, whereas others specialised and grew in size. In addition, the farmers' relationships with supply industry, craftsmen and consumers, reconfigured from being based on familiarity and personal relationships to a market relationship.

Within the processing industry a similar reconfiguration took place from the 1950's onwards. The many small dairies and abattoirs are merged into large-scale cooperatives, for instance the dairy Mejeriselskabet Danmark (MD) in 1970, the poultry abattoir Danmarks Andelsfjerkræsslægterier (DANPO) in 1971 and the Dansk Landbrugs Grovareselskab (DLG) in 1962. The reorganisation also influenced the internal communication in the cooperatives in favour of the large-scale producers, for instance, the dairy trade organisation changed their earlier democratic ideals of one person one vote to a proportion based on production.

In the 1950's many European countries increase their tax barriers and the Danish agricultural sector falls behind in the wage competition with the industry. The liberal mind-set was replaced by a demand for subsidies, hence, rather than improving income by increasing production, income should now be secured by subsidies. An important milestone is the Enabling Act of 1957 that introduced various subsidies such as fertiliser subsidies, secured minimum prices, and postponed the land tax and export subsidies, in an attempt to maintain the production capacity. This marks a fundamental rupture in the relationship between society, the state and the agricultural sector as consumers now had to pay inflated prices for agricultural commodities and the state changed its engagement with the agricultural sector from a tool for

self-support to a direct subsidy. The policy change was legitimised by two factors: farmers felt they were entitled to a share of the general prosperity growth in society; and the production capacity had to be maintained until Denmark could join the ECSC (Ingemann, 2002).

Simultaneously 6 European countries led by France had formed the European Coal and Steel Community (ECSC) in 1951. Denmark and England both joined the EC in 1973. At the time it seemed like a happy marriage, the EC and in particular southern Europe was undersupplied with agricultural commodities and Danish farmers gained access to a significant amount of subsidies (about one third of its total Gross Factor Income in 1973) (Bjørn & Pedersen, 1988). The objectives of the agricultural policy of the EC subsidies are stipulated in article 39 of the treaty of Rome, to: *“(a) increase agricultural productivity, by ensuring the rational development of agricultural production and the optimum utilisation of the factors of production, particularly labour; (b) to ensure thereby a fair standard of living for the agricultural population (...) (c) to stabilise markets; (d) to guarantee regular supplies; and (e) to ensure reasonable prices in supplies to consumers* (EC, 1957). Hence, the treaty of Rome stresses the interdependence between agriculture and society, but it also institutionalises productivity improvements as the means for agriculture to fulfil its social contract.

Summing up

The rapid structural development and functional specialisation meant that farms gradually grew in size, and farmers went from seeing self-sufficiency as a natural aspect of a good economy to seeing it as an obstacle for specialisation. Furthermore, farmers lost the generational perspective, they could no longer be sure that the son would take on the farm when they died and the development implied that a number of the people that grew up on farms would not necessarily be employed in farm work. Farming ceased to be a labour intensive family activity and, rather than an obligation dictated by tradition, farming became a choice that the next generation could opt out of. This largely changed the farmer's perspective on his own farm, from a focus on a long temporal perspective to a much shorter time horizon. These new uncertainties mean that the future will be significantly different from the past and time suddenly becomes a variable that needs to be taken into account. Investments are not placed to secure the coming generations, but to benefit the present ones. Finance enables specialisation, but farms are still primarily a size that enables a farmer to purchase and have a small family business. More significantly, the farmer gradually moves away from market based income to subsidies.

Industrial farming

The late 1970's and early 1980's marks the beginning of a new area. Denmark has a trade balance deficit, public overspending and Denmark, like other European countries, implements policies that limit public spending and deregulate the financial sector. Also at a European level the productivist policies are questioned due to their cost and the massive overproduction that have now become the result. Several factors have gradually worked to discipline farmers to become financial farmers and although it has not really been a dominating discourse until recently its origins are older.

Whereas growth in the welfare state farming discourse is seen as a necessity because of food need, growth in the industrial farming discourse is seen as a rational principle in its own right. As growth begins to be accepted as the fundamental condition of farming it marks the beginning of a new farming discourse in which the current state of the farm economy is no

longer as important. What matters is how the economy is expected to be in the future, and since the only sustainable form of production is an expanding production it justifies an overall development plan that emphasises growth and expansion. This is reflected in a commentary from 1972: *“A farmer, who buys a property today, cannot expect that a production facility which appears harmonious today will continue to be so. The labour use in Danish farms is decreasing by 4-5% each year, hence to maintain a harmonious farm, where the production factors are fully utilised, it must grow by 5-4% each year unless the labour is reduced (...) A simple calculation shows that a property of 25 ha during a 10 year period must have a size and configuration of its production that equals a property of 40 ha today.”* (Nielsen & Zimmermann, 1972). Hence, the perception of economies of scale had changed from being a necessity derived from mechanisation to being rational principle or a natural order like the law of gravity, hence harvesting the benefits of scale-economics is just as important as harvesting the fields. Furthermore, another commentator notes that there are *“significant benefits of adopting an economy of scale”* and *“truly, standing still is going back”* which in many ways can be seen as a motto for the industrial farming discourse (Mogensen & Mørkeberg, 1973).

In the 1980's it also became clear that the agricultural production within the European Union had risen faster than the consumption and there was a massive overproduction within some product categories, and the CAP support claimed a massive share of the EU budget. Furthermore, foreign trade partners began pleading for a more liberal trade policy. The CAP was reformed initially in 1984, where milk quotas were introduced, in 1988 where an expenditure ceiling was imposed on the European Council, but most significantly with the MacSharry reform in 1992, which lowered the price support by 29% for cereals and 15% for beef and compensated by introducing direct payments, based on the size of the farmed area. Although, the MacSharry reforms at the time did not change the farm economy much, it marks an important step in the implementation of the industrial farming discourse because it changed the incentive structure for the farmers and largescale production units were now an advantage.

The MacSharry reforms paved the way for the Uruguay Round of GATT talks in 1995, which ended with the establishment of the WTO and a classification of subsidies which were considered either detrimental or acceptable to foreign trade (Otte Hansen, 2001). The GATT free trade talks had previously exempted agricultural policy, but had been engaged with other aspects of international trade. When agricultural trade was finally taken up in 1995 it reflected not only the fact that the EU's foreign trade partners were discontent with EU's support of its own agricultural sector, but also the more substantial change in the perception of agriculture from an important cultural foundation to an industry that should be regulated like any other industry (Otte Hansen, 2001). Hence, the cap regime has moved away from a production oriented policy underpinned by price support to a 'multifunctional' policy in which numerous aspects of farming are emphasised. The reforms were politically necessary, but also had the effect that the mechanisms that stabilise the prices for agricultural commodities fluctuate much more.

Contemporary farmers cannot shy away from the financial markets, but modify their behaviour according to these markets. This has also gradually changed the focus of the farmers, being profitable is no longer just about managing the fields but increasingly about acting in financial markets. The discourse of industrial farming has also become embedded into the daily farming practices grain trade. In a recent paper, Thorsøe and Noe (2015) find that plant producers

have placed large investments in grain storage facilities to act as grain speculators and sell their produce at the optimal time, as noted by one of their interviewees: *"I think that it is just as important to follow the [world] market as it is to be a good plant producer"*. This introduces a new temporal perspective for the farmers, as the timing of investments or sales has suddenly begun to matter to a higher extent, but it has also changed the identity of the farmer from a producer of goods to a financial speculator, which is reflected in the fact that economists have now started criticising Danish farmers for their lack of financial skills. For example, one of the trade journals that specialises in economy note it as a problem that Danish farmers are not good enough in using the many new financial opportunities that are available to them: *"prices are extremely fluctuating and many Danish farmers do not guard themselves well enough against these fluctuations. Danish farmers are very good at growing the corn, but it is also very important to buy and sell well."* Furthermore, (Jakobsen ,2012; Jakobsen, 2013) note that farmers continuously assess their own production based on tangible measures such as yield, number of cows or size of the farm, rather than intangible measures such as productivity, solidity or instalment time. This also suggests another important shift compared with the welfare state farming discourse, whereas this discourse was characterised by a need to grow *in order* to survive today growth *is* the objective, independent of its financial implications.

One of the roots of the current financial crisis in Danish farming was the gradual build-up of a land price bubble, in which the land price was inflated but eventually collapsed in 2009. Today the land price is more than half of what it was in 2009. There are arguably many reasons for this build-up, including increasing equity, easy access to loans, aggressive financial marketing and banks that were willing to take huge risks. However, at the heart of the matter was an extreme demand for land, because the acquisition of land was a prerequisite for expansion of the farm and farming could only be viable if it was ever expanding. It indicates a powerful discourse that has justified taking extreme financial risks, because of a strong perception that there is only one way to be a farmer, and that is to be a financial farmer. This is also reflected in the criteria for obtaining loans, as investments are expected to yield at least 5-10 percent. Whereas farmers in the post WWII period aspired to live as industrial workers, the farmers in the new millennia aspire to live as industry managers and moreover this aspiration has become a tangible measure of success that may determine access to loans.

An important regulatory basis for farming in Denmark is the agricultural law (Landbrugsloven) that frames the regulation of the farming activity, the structural development and designates who can legally become a farmer. The agricultural law originally was put in place to enable a "democratic" distribution of the farmland and to prevent a situation in which only a few farmers are in control of all the production facilities, like before the reforms in the late 18th century. The law was liberalised in 2010 and 2015 and these revisions in many ways reflect a changing legal perception of agriculture. In 2010 restrictions on the size of a farm and density of animals were removed and in 2015 restrictions on ownership was abandoned. Attracting investment capital is a major concern in the 2015 revision and noted as the primary objective, which is to: *"Modernise the agricultural act by improving the opportunities for investments in the agricultural industry and thereby enable farmers to attract capital for purchase and further development of farms."* Hence, the new and updated version of the agricultural law enables new forms of ownership, such as, non-farmers, liability companies or pension funds. Hence, a financial farmer, does not have to be an actual farmer (or an actual person for that matter), but may in fact be a hedge fund or a financial speculator. The changes in the agricultural law

indicate a more fundamental shift in the regulatory perception of farmers, hitherto it has been an important objective of the law to maintain “family farming” by limiting the structural development. However, this has changed gradually so that today the major concern is to ensure that the conditions for agriculture are comparable to those of the industry. Hence, today the financialisation discourse has become so powerful that it trumps the basic principles on which the agricultural law was originally produced. A good indication of this power is the fact that the regulatory change takes place without much previous public debate or protests, apparently the growth maxim is not really controversial and it seems that the liberalisation is merely bringing the regulation in line with the hegemonic discourse of industrial farming.

Although Danish farming is currently in a crisis, in the industrial farming discourse the future of the Danish farming industry looks bright, which is underscored in two recent green papers published by two commissions involving a number of stakeholders and NGO's. “*The global food demand increases significantly and will continue to do so in the coming decades*” (Jespersen, 2013) and further, “*The growing population and increase in prosperity will result in an increasing demand for the products and solutions that Denmark is able to deliver (...) therefore it is crucial that we, in the coming years, strengthen and develop the food sector to create growth and employment*” (EVM, 2013). Growing food demand in a finite world is almost like a hen that lays golden eggs; although production at the moment is financially unsustainable it will not continue to be so in the future. This strong belief is also reflected in the interpretation of the current low commodity prices. Although the EU have abandoned their price support and a number of speculators have entered the commodity market, world market price fluctuations are generally considered as extraordinary events. However, these price fluctuations have become more the rule than the exception.

Summing up

In the beginning of the 1980's the structural development that had been initiated in the post war period, began to crystallise into a new form of agriculture. Farms had grown considerably in size and most farms specialised in only one form of production, which implied that farmers were increasingly exposed to market risks and uncertainty and it had become paramount for the farmer to manage these risks. Farming is no longer about just growing the land; managing investments and market considerations have increasingly begun to matter. Hence, the Taylorist management language that had previously dominated the agricultural discourse is replaced and supplemented with business school vocabulary, introducing words such as risk management, the rise of various investment instruments such as futures, swap loans and derivatives. In the industrial farming discourse agriculture is an industry, and the farmer has somehow become completely detached from the farm as farming procedures are standardised, and a situation has emerged where farmers no longer themselves own their land, but where the land is owned primarily by financial institutions that may dictate strategy and investments. A new perception of time has also emerged, the past is no longer of much concern, other farms are purchased at the blink of an eye and the future is anticipated with daring investments; agriculture has become a “risky business”.

Concluding remarks

The development that has been uncovered in this paper reveals that although agriculture has evolved quite a lot in the past 200 years the diagram has remained relatively stable, although it has found various discursive manifestations (see Figure 1). Although Danish farming has been through numerous crises, the system has always endured maintaining the implicit

normative foundations that were introduced along with the rural reform in 1788. Furthermore, the papers document that the financial discourse is something that is actively constructed by a range of actors, partly farmers and their associations, but also policymakers who have encouraged a particular mode of farming. This dependence of political decisions underscore that it could have been otherwise, events could have been interpreted differently, actors could have favoured some actions over others and policies could have been formulated differently.

	Family Farming	Welfare state farming	Industrial farming
Diagram	7 implicit norms: (1) Farming is the backbone of society; (2) Self-ownership is a superior organisational form; (3) Agricultural policies should be based on liberal ideas; (4) Unity makes stronger; (5) Agriculture should be oriented at export markets; (6) Agriculture should be science based (7) Standing still is going back.		
Origin	The changing structure of Danish agriculture in 1870's	Post war mechanisation and income crisis in the 1950's	Deregulation in the 1980's and reconfiguration of the agricultural policies in the 1990's
Central concepts that define the discourse	Rural culture Rationality Cooperative organisation	Efficiency Productivity Specialisation	Growth Risk management Investment and asset
Optimisation strategy	The state of the land	The use of manual labour	Capital investments
Temporal perspective	Generational perspective	Agriculture becomes an option and sons may take over neighbouring farms to merge with fathers.	No long-term temporal perspective
Central development in the agricultural sector	Individualisation of agriculture and strongly coupled with the formation of freehold and cooperative organisation. The institutionalisation of Denmark as a commodity exporting nation and farming as a nation building project. Transition from	Increasing productivity in the post WWII period via mechanisation. Farms become specialised and grow in size. Cooperatives are merged into big multinationals, thereby changing their perspective.	The individual farmer is more or less absent from the farming activity and the goal has changed from being efficient to expanding and thereby attaining a higher market share. The "farmer" is no longer a farmer in the practical sense, but a businessman that

	grain production to animal production.		needs to navigate in the financial world.
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Figure 1. Development of the Danish farming discourse

The diagram has been extremely effective, as it has been embedded into the entire production system. It is not just found with the primary producers, but it is also adopted by the processing companies, the supply and financial industry, as well as policy makers. All of these actors have become aligned towards a particular mode of production. Hence, the emergence of the discourse of industrial farming offers an explanation for the reasons behind the financial strategy that was adopted by Danish farmers prior to the financial crisis. In this perspective the current mode of agriculture is rather the result of a general societal development and a particular notion of farming than the result of market pressure and individual decision-making. Therefore, in this perspective the current financial crisis is not just a financial crisis induced by poor market conditions, but it is more fundamentally an identity crisis of Danish agriculture as it problematises some of the underlying implicit norms of agriculture.

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The role of financial support: strategies of farm households on diversification of income sources under two policy scenarios

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Abstract: External framework conditions such as financial support provided under the European Common Agricultural Policy (CAP) influence decision-making of farm households on how to distribute labour resources, on and off the farm business, to earn household income. To assess the relation of income diversification strategies and financial support, we have tested two policy scenarios as benchmark cases of farm behaviour: one describes the status quo and the other assumes a complete termination of financial support. Using survey data of 2,154 farm households, preferences regarding future income generation through agricultural production, on-farm diversification activities, and off-farm employment (including a shutdown of production) were compared across scenarios. To account for the heterogeneity of investigated farm households, a typology approach was applied to distinguish type-related decision-making structures. The typology generated by factor and cluster analysis integrated relevant variables and depicted six farm types. The farm types showed strong variations regarding their behaviour under both scenarios. Results indicate that under hypothetical conditions of termination of CAP support, an increased share of farm households – throughout all types – would choose to quit farming, yet to varying degrees. Farms opting for continuation tend to diversify activities in order to cope with increased income risk and exposure to markets. The behavioural patterns thus show the complex interrelationships of internal household and business characteristics and external framework conditions with farm households' decision-making for their survival. These are relevant for the design of targeted rural development policies.

Keywords: Rural development, CAP, labour allocation, pluriactivity, cluster analysis, farm typology

Introduction

In response to market pressures, changing political framework conditions, increased price and cost pressure as well as economic risk, farm households often redistribute their resources, particularly labour, in order to secure their income. Diversification as an extension of on- and off-farm business activities thus represents an important adjustment and restructuring strategy. Diversification of the business on the agricultural holding includes agricultural services, contract farming, tourism or direct marketing (Ilbery et al., 1997; Piorr et al., 2007; Præstholt & Kristensen, 2007). Notably family and smaller farms tend to broaden their income basis by employing household members outside the agricultural holding (Gasson et al., 1988; Maye et al., 2009; McNamara & Weiss, 2005; Meert et al., 2005). Farms gradually shifting their labour resources towards off-farm employment may finally decide to exit from farming completely (e.g. Breustedt & Glauben, 2007; Glauben et al., 2006; Kazukauskas et al., 2013).

Formulated in terms of microeconomic theory of household behaviour, decisions to reallocate resources result from comparing the utility of a marginal increase of labour supply across different alternatives. Farmers compare the benefits of working on-farm in different enterprises, for primary production is in general assumed to exhibit decreasing returns to scale, with the wage that could be earned in off-farm employment. The indifference point represents the reservation wage rate which can be derived from utility maximising household models (e.g. Huffman, 1980). Income risk is another driving factor often included in modelling (McNamara & Weiss, 2005). Translating theoretical models into empirical applications such as regression models or multivariate clustering approaches, several studies have investigated those factors that drive farmers' decisions to shift their resources away from primary agricultural production. Tested variables include farm households' socio-economic characteristics and the business structure of their holdings (Barbieri & Mahoney, 2009; García-Arias et al., 2015; Hansson et al., 2013; McNally, 2001; Serra et al., 2005; Sharpley & Vass, 2006) as well as the local context and framework conditions (Lange et al., 2013; Meraner et al., 2015; Pfeifer et al., 2009; Zasada et al., 2011). Changes in the European Common Agricultural Policy (CAP), e.g. the implementation of decoupled single farm payments, have been theorised to influence labour allocation decisions of farmers by generating wealth and substitution effects (Hennessy & Rehman, 2008; Petrick & Zier, 2011). The CAP also fosters on-farm diversification activities under its Rural Development Programme by providing substantial market incentives for business establishment and diversification activities (Dwyer et al., 2007; Zasada et al., 2015).

In this paper, we aim to further enhance the understanding of the strategic decision-making of farmers with regard to the allocation of household labour resources and employment of a diversification strategy on or off the farm, including the shutdown of agricultural production. We are primarily interested in analysing policy impacts by comparing two scenarios with varying degrees of financial support using the case of hypothetical termination of all support measures as benchmark. Our study is based on empirical farm-level data from a sample of 2,154 farms across a variety of case study regions in nine European countries. To account for behavioural differences between farms, we identify different farm types using a quantitative modelling approach of factor and cluster analysis. The propensities to diversify are assessed for these farm types. The modelling procedure is summarised in the following section. We then compare the differences in decision-making behaviour across farm types and scenarios. The following discussion takes up these aspects and contextualises them with the literature and the policy dimension feeding into a final conclusion on our findings. The presented research contains findings that are an extension of results and a further application of methods described in Weltin et al. (2016).

Data and methodological approach

Data set

The data used for analysis are obtained from a questionnaire-based survey of 2,363 farm households in eleven case study regions located in nine European countries. The survey was carried out within the European research project CAP-IRE in 2009. The sampling procedure is described in Viaggi et al. (2013a). Table 1 provides an overview on the included regions.

Table 1. Overview on case study areas included in the sample

Case study area	Country	NUTS	No. of farms (2010)	UAA in Mio. ha (2010)	Av. farm size in ha (2010)	No. of observations
Emilia-Romagna	Italy	ITH5	73,470	1.03	14.5	300
Noord-Holland	Netherlands	NL32	5,010	0.13	26.1	300
Macedonia & Thrace	Greece	EL11	178,600	1.91	10.7	300
Podlaskie	Poland	PL34	84,700	1.03	12.2	249
North Eastern Scotland	United Kingdom	UKM5	4,740	0.45	95.9	168
Andalusia	Spain	ES61	246,100	4.40	17.9	201
Yugoiztochen	Bulgaria	BG34	56,980	0.87	15.3	273
Centre	France	FR24	25,080	2.31	92.2	140
Midi-Pyrénées	France	FR62	47,900	2.54	53.0	155
Lahn-Dill-District	Germany	DE722	611	0.24	39.8	117
North-East Brandenburg	Germany	DE40	3,381	0.86	255.3	160

Source: Eurostat data base. Note: UAA= utilised agricultural area.

Research design and methods

To compare farmers' strategies regarding future (from 2014 onwards) diversification of their income sources, we used stated preferences of farm households included in the survey. Their decisions were assigned to five categories as depicted in Table 2. Farmers were asked to state their plans under two policy scenarios: first, a baseline scenario with continuation of European agricultural policy; and second, a "No CAP" scenario with the hypothetical complete abolishment of all forms of financial support.

Table 2. Investigated income diversification strategies

Strategy	Explanation
Combined diversification	Household increases labour for on and off-farm income diversification.
On-farm diversification	Household increases labour for on-farm income diversification.
Off-farm diversification	Household increases labour for off-farm income diversification.
No diversification	Household does not increase any income diversification activity or decrease labour for diversification activities.
Exit	Household stops the farming activity completely.

Source: Own representation.

Despite acknowledging the relevance of external factors, such as regional (bio-physical and socioeconomic) framework conditions, in this paper we focus on the dependency of diversification decisions from internal (farm household and business) characteristics as identified in the literature. Therefore, we used a data set of heterogeneous European farms and applied factor and cluster analysis to develop a farm typology. Such delineation of farm types makes apparent different patterns of strategic decision-making behaviour. Previous applications focus on farm-specific development pathways (Iraizoz et al., 2007), resource use behaviour (Kurz, 2008; Schwarz et al., 2009), differences within specific production systems (Caballero, 2001; Moreno-Pérez et al., 2011; Riveiro et al., 2013) or, in the case of income diversification, farm typologies identify adopters of alternative farm enterprises

(Daskalopoulou & Petrou, 2002; Præsthholm & Kristensen, 2007) or differences in the propensity to diversify (Chaplin et al., 2004; Lange et al., 2013; López-i-Gelats et al., 2011).

A cluster analysis aims at maximising the heterogeneity between while minimising the homogeneity within clusters as an appropriate feature to delineate different farm types (Köbrich et al., 2003). In order to identify relevant variables that can be used to cluster farms, we selected as many variables as possible from the data set based on a literature review on income diversification. We applied factor analysis to reveal the correlation structure of the variables in the data set and reduce its dimensionality for cluster analysis. The income diversification decisions of farmers were compared across scenarios for the identified farm types in the cluster analysis. This was done by comparing relative frequencies of strategy choices. All steps of the methodological approach are summarised in Figure 1. The data includes many non-metric variables, which is why we could not apply standard procedures of factor and cluster analysis but had to address the peculiarities of a mixed data set. Relevant steps are included in Figure 1 and references are provided when non-standard approaches had to be used. Otherwise, factor and cluster analysis were performed according to Backhaus et al. (2011, p.323 ff.).

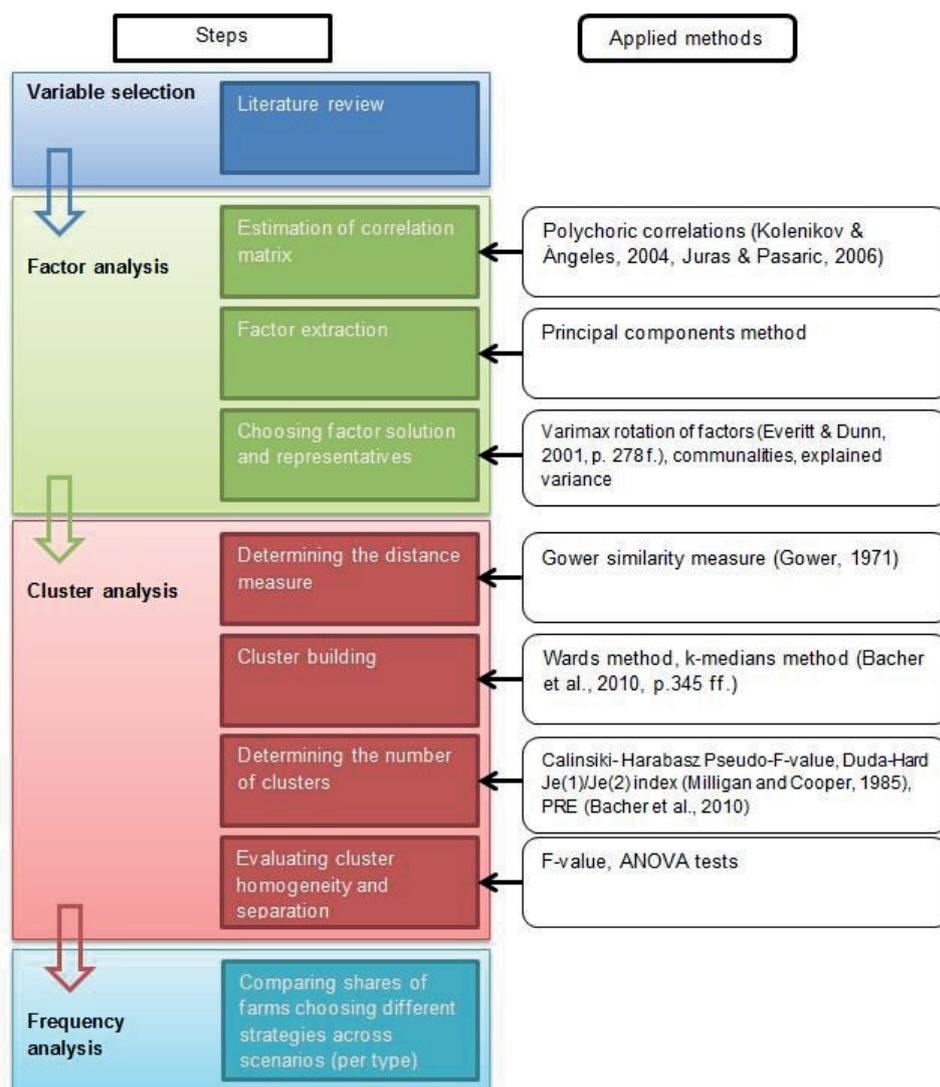


Figure 1. Applied methodological steps. (Source: Own representation)

Results

Identified relevant factors

We identified 21 relevant variables for income diversification decisions included in the data set. They are presented with descriptive statistics in Table 3. As a result of the factor analysis, we reduced the number to eleven factor representatives which are displayed in bold letters in Table 3. The factors explain 86% of total variance. All communalities i.e. explained variances of single variables are at least 0.78. Thus the eleven representatives approximate the information content of all 21 variables for the subsequent cluster analysis. Due to missing values, the number of observations had to be reduced to 2,154 for cluster analysis.

Table 3. Selected variables and factor representatives

Variables (Factor representatives in bold letters)	N	Min	Max	Mean	SD
<i>Social and demographic household characteristics</i>					
Number of household members	2,356	1	12	3.50	1.43
Number of children (< 18 years) in household	2,345	0	6	0.70	1.02
Number of old people (> 65 years) in household	2,342	0	5	0.50	0.75
Members working full-time on farm	2,345	0	9	1.20	0.80
Members working on farm (total)	2,337	0	9	1.90	1.05
Highest educational level in household	2,346	1	6 ^b	3.60	1.13
<i>Income</i>					
Income share from agricultural production	2,290	1	6 ^c	4.25	1.76
<i>Structure of production</i>					
Land owned (in ha)	2,333	0	5,000	45.9	163.96
Land operated (in ha)	2,304	0	7,500	93.4	300.20
Specialisation in cropping ^a	2,363	0	1	0.41	0.49
Specialisation in livestock^a	2,363	0	1	0.28	0.45
Organic farming activities^a	2,363	0	1	0.11	0.31
<i>Farm organization</i>					
Total number of employees ^g	2,302	0	104	2.10	6.60
Number of full-time employees	2,312	0	40	0.70	2.51
Sole proprietorship ^a	2,363	0	1	0.72	0.45
Participation in agri-environmental scheme ^a	2,324	0	1	0.26	0.44
Use of farm advisory service^a	2,348	0	1	0.57	0.49
<i>On-farm diversification activities</i>					
Labour share for on-farm diversification	2,276	0	6 ^c	0.40	1.05
Direct sale to final consumer ^a	2,331	0	1	0.12	0.33
<i>Location</i>					
Less-favoured area	2,359	0	2 ^d	0.98	0.95
Altitude	2,358	1	3 ^e	1.50	0.65

Source: Own representation. Note: ^a Dummy variables, coded 0 and 1; 0 equals "no" and 1 equals "yes"; ^b coding: 1 "none and primary", 2 "lower secondary education", 3 "upper secondary education", 4 "post-secondary non-tertiary education", 5 "first stage of tertiary education", 6 "second stage of tertiary education"; ^c coding: 1 "<10%", 2 "10% to 20%", 3 "30% to 49%", 4 "50% to 69%", 5 "70% to 89%", 6 ">89%". For labour share on-farm diversification 0 means "no on-farm diversification"; ^d coding: 0 "not", 1 "partly", 2 "completely"; ^e coding: 1 "plain", 2 "hill", 3 "mountain"

Description of identified farm types

The result of the cluster analysis favours the existence of six clusters. Comparing relevant characteristics of the farms represented in the clusters as displayed in Table 4, farm types can be well interpreted and named. Multivariate analysis of variance (MANOVA) tests confirmed that mean vectors of variables differ across clusters. However, most clusters i.e. farm types are set apart by certain characteristics while being similar to others concerning other variables.

In short, the generic farm types can be characterised as follows: *Pluriactive small farm households* (type 1) consist of smaller and rather older households that generate a larger share of income outside agriculture. *Young organic farm households* (type 2) all engage in organic farming activities, consist of big and comparably young families, and are most likely to hire additional employees. *LFA-adapted mixed farms* (type 3) lie to a large extent in less-favoured areas that are relatively frequently mountainous, where they engage in mixed farming, and they have the best education. *Traditional part-time crop farms* (type 4) are crop specialists in non-LFA plain areas that are rather old, apply small amounts of household work on-farm and least likely to engage in on-farm diversification. *Small-scale livestock specialists* (type 5) are small households which rarely hire employees, specialised in livestock farming, but with high propensities for on-farm diversification. *Intensive livestock professionals* (type 6) generate high shares of income from livestock farming businesses run by big families on comparably large areas of land in less-favoured areas. All farm types are present in almost all case study areas albeit with varying extent and some regional tendencies of agglomeration.

Table 4. Characterisation of farm types by selected variables

Farm type		1	2	3	4	5	6	all
Number of observations		540	138	328	586	329	233	2,154
<i>Social and demographic household characteristics</i>								
HH size	Share of HH with ≤2 members	35	12	27	32	34	12	29
HH structure	Share of HH with children	36	70	42	31	44	65	42
	Share of HH with old people	36	25	26	29	31	34	31
HH work	Share of HH with 0 members (full-time)	21	17	13	20	16	3	16
	Share of HH with ≥ 2 members (full-time)	25	46	38	30	32	62	35
Education	Mean of levels	3.6	3.7	3.8	3.4	3.6	3.5	3.6
<i>Income</i>								
Income from agriculture	Share of HH with <10%	15	6	10	13	12	4	12
	Share of HH with ≥90%	25	40	36	40	35	60	37
<i>Characterisation of the agricultural holding</i>								
Specialisation	Share of crop specialist farms	55	43	40	69	0	0	41
	Share of mixed farms	45	49	59	25	0	2	31
	Share of livestock specialist farms	0	7	2	6	100	98	28
Organic	Share of HH producing organic products	5	100	0	4	9	5	11
Land	Median owned land in ha	10	15	10	10	16	28	12
	Median operated land in ha	19	22	35	20	26	50	25
<i>Farm structure and organisation</i>								
Employment	Share of HH with full-time employees	18	31	30	21	15	27	22
	Share of HH having employees	31	55	52	52	25	39	42
Farm organisation	Share of HH with sole proprietorship	78	83	69	69	65	73	72
	Share of HH with farm advisory service	0	73	100	100	0	96	58
	Share of HH with AES	19	45	30	24	28	34	27
<i>Specific variables regarding on farm diversification</i>								
On-farm diversification	Share of HH with activities	20	20	17	10	23	14	17
	Share of active HH with labour share for on-farm diversification >50%	15	15	18	24	24	6	18
	Share of HH with direct sale of products	13	26	15	9	13	6	12
Location	Share of HH not located in LFA	44	34	0	94	41	15	47
	Share of HH completely located LFA	48	60	88	0	54	73	45
	Share of HH located in plain area	60	28	21	74	74	49	57
	Share of HH located in mountainous area	5	18	23	1	4	21	9

Source: Own representation. Note: Colouring indicates highest values in dark green, second highest in light green, lowest in dark red and second lowest in light red; HH = household, AES = agri-environmental scheme. Type 1: Pluriactive small farm households; Type 2: Young organic farm households; Type 3: LFA-adapted mixed farms; Type 4: Traditional part-time crop farms; Type 5: Small-scale livestock specialists; Type 6: Intensive livestock professionals

Policy scenario differences in strategic decision-making of farm types

The comparison of farm types' choices regarding future diversification strategies reveals that substantive differences in propensities for future strategies exist when policy conditions are assumed to change. Figures 2a to 2f show the relative frequencies of farms choosing one of the five discussed strategies for each farm type across policy scenarios. Considering all farms, reflected by the orange bars, the general picture indicates that across types and scenarios the three diversification options are least likely. The young organic farm households are the only exception with over 40% of farms opting to increase one of the diversification activities in the baseline scenario, with a strong majority for on-farm diversification. Pluriactive small farm households are least likely to diversify. "No diversification" is the strategy mostly applied under the baseline scenario.

The striking feature under the "No CAP" scenario is the increase in exit rates. Although for exit decisions, differences across farm types are evident. Under the baseline scenario, young organic farm households and intensive livestock professionals have very low exit rates, whereas these exceed 30% for the other livestock type and 20% for the pluriactive small farm households and traditional part-time crop farms. LFA-adapted mixed farms show with 62% the highest exit rate in the "No CAP" scenario. Under the conditions of terminated financial support, young organic farm households have a large increase in exit rates, whereas the exit rate only modestly increases for the intensive livestock professionals to 32%. On-farm diversification shares decrease under the "No CAP" scenario for all types, whereas combined and off-farm diversification shares increase for some, especially for the livestock types. Taken together, shifting labour resources towards off-farm employment is a general reaction across types.

The high propensity to opt for the exit strategy conceals much of the fluctuations in single diversification trajectories chosen by farm households that would continue their business. Therefore, dark bars show the propensity to increase diversification on-farm, off-farm or combined only for the surviving farms (under the baseline scenarios 363 farms exit, under the "No CAP" scenario 951).

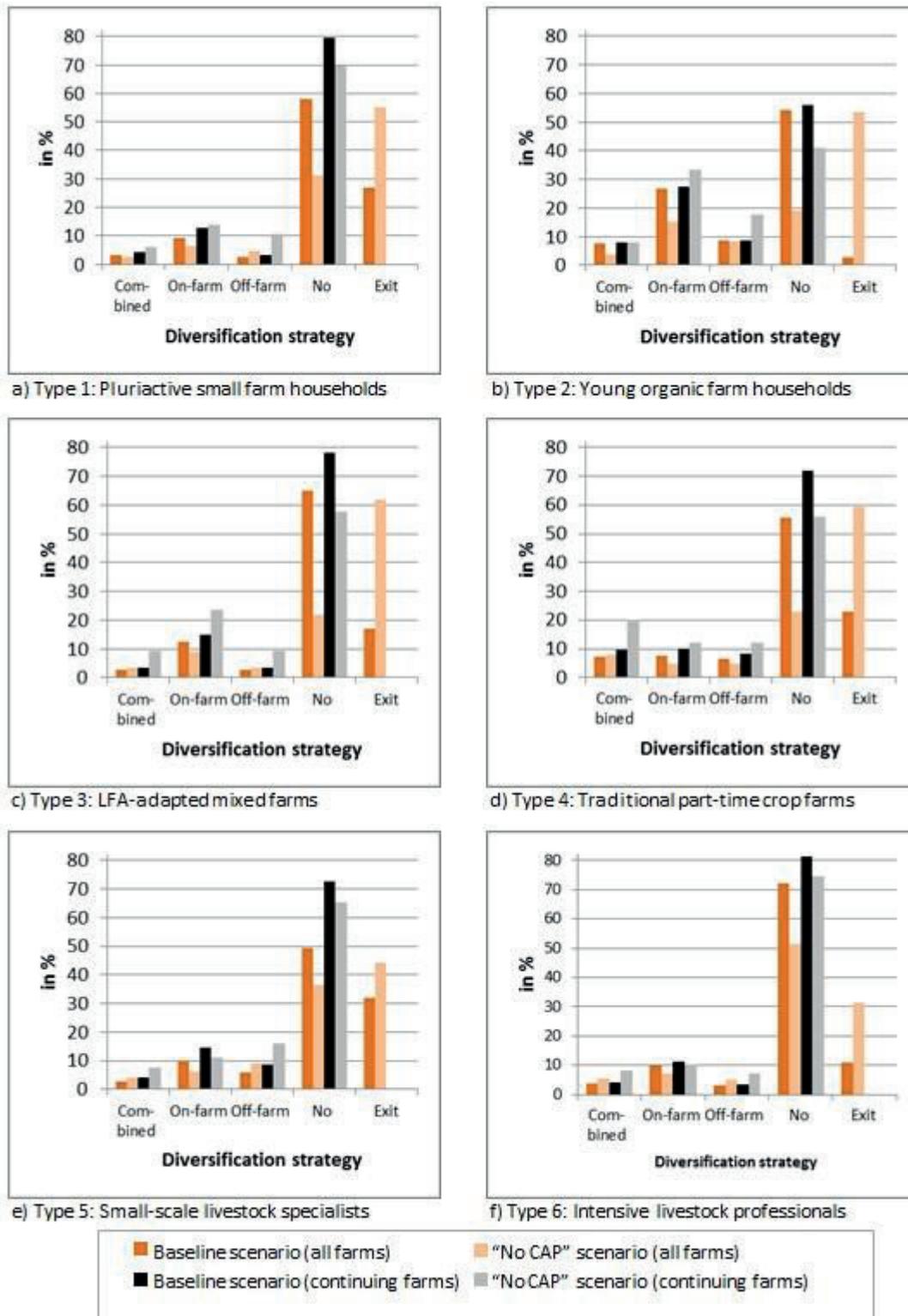


Figure 2 a) to f). Differences in the propensities to choose one of the five diversification strategies across scenarios per farm type. (Source: own representation. Note: Strategies are described in Table 1)

The overall picture shows that for most farm types the preferred strategy is increasing on-farm diversification. Under the “No CAP” scenario all diversification strategies are chosen more frequently as a response to the termination of financial support, except on-farm diversification

for the livestock types. Almost all farm types show the strongest increases in off-farm diversification strategies under less supportive political circumstances. However, there is indication for strong farm type differences. Amongst the already identified leaders in diversification (the young organic farm households) almost 35% opt for an increase in on-farm diversification. They are followed by the LFA-adapted mixed farms. The traditional part-time crop farms have the highest shares of farms choosing combined diversification with an increase of up to 20% under the “No CAP” scenario. Farm types with generally low preferences for diversification are the intensive livestock professionals and the pluriactive small farm households.

Discussion

Methodology

Farm typologies are applied to account for heterogeneity in the motivations and decisions of farm households (Kurz, 2008; Schwarz et al., 2009) and to distinguish different behavioural patterns (Cortez-Arriola et al., 2015). The developed farm typology shows differences in behaviours across types. This demonstrates the usefulness of this tool in the case of a heterogeneous large sample of farms with a broad regional distribution and widens the effective use of typologies addressing questions of pluriactivity, for example by Chaplin et al. (2004); Daskalopoulou and Petrou (2002); Lange et al. (2013); Præsthholm and Kristensen (2007), beyond a regional scale. It allows detection of common patterns and trends for the behaviour of farm households that stem from very different areas in terms of agricultural development, structure and agronomic site conditions in Europe.

Future strategies of the households used in the analysis are stated preferences. The question to what extent these equal the actual future behaviour of the households ought to be addressed. The concordance has to be precise enough to investigate stated preferences as proxies of actual behaviour. Viaggi et al. (2013b) deduct from the literature on stated preferences that they reveal the actual behaviour in the majority of cases. If present, the direction of the bias might be ambiguous. However, the authors argue that due to the difficulties households face to plan ahead, the strategy of “no reaction” might be overestimated which is supported by the fact that 27% of farms in the baseline and 23% in the “No CAP” scenario either did not know what they would do or chose not to answer the strategy questions.

Behavioural differences in the baseline scenario

Our results show that in the baseline scenario the “no reaction” strategy dominates. Apart from possible distortions by a small bias deriving from stated preferences, it might indicate that many farms have already reached the optimal amount of diversification, as diversification shares have been found to be already substantial (Bateman & Ray, 1994; Pieniadz et al., 2009). However, all investigated farm types are below the EU average of one third of farms pursuing other gainful activities (European Commission, 2013, see Table 4). Under the investigated baseline scenario that matches the policy of the CAP 2007 - 2013, a natural exit rate ranging from three (young organic farm households) to 32% (small-scale livestock specialists) consists of farmers that plan to shut down their business in the near future despite the current policy support. Reasons found to explain exit tendencies are among others ageing e.g. for the pluricative small farm households (Glauben et al., 2006), business sizes e.g. for

the small-scale livestock specialists (Glauben et al., 2006) and crop production e.g. for the traditional part-time crop farms (Breustedt & Glauben, 2007).

We also found farm type specific patterns regarding the other diversification activities. The farm typology, assigned to six clusters, exhibits a mixture of traditionally established types like “pluriactive small farm households” or “LFA-adapted mixed farms” for which diversification strategies already generate a substantial share of income, as described in the literature (Bessant, 2006; López-i-Gelats et al., 2011; McNally, 2001; Robinson, 2013), and rather novel ones like “young organic farm households” or “intensive livestock professionals”. In particular young organic farm households but also LFA-adapted mixed farms tend to further increase on-farm diversification activities. This is especially visible when looking only at those farms that stay in business. This behavioural pattern could be related to their larger family size because the attractiveness of exploiting unused family business potential compared to food production potential is high (Mann, 2009), and location in less-favoured areas which can be favourable for diversification into agritourism (McNally, 2001).

Behavioural changes under the “No CAP” scenario

Interesting insights into the motivation and drivers to choose future adjustment and restructuring strategies can be gained from the comparison with the hypothetical scenario of termination of all financial support. Across all farm types, the main tendency is to shift labour towards off-farm employment mainly in the form of shutting down the business (except for the livestock types exit rates exceed the 50% threshold), but also in the application of combined and off-farm diversification strategies. This means that missing financial support will generate pressure on the labour market in other sectors. In particular, taking into account the high share of exit decisions of farms in LFA locations under the “No CAP” scenario, the challenging implications for rural development have to be considered.

The most robust type is the intensive livestock professionals, whose income structure barely depends on support, indicating that lump-sum financial support schemes such as single farm payments do not influence the labour allocation decision (Pieniadz et al., 2009). In contrast, the young organic farm households, which are leaders in future diversification activities across scenarios but whose exit rates increases strongly from 3 to 53%, are very likely to depend on financial support for their survival. Petrick and Zier (2011) describe how organic farms engaged in agri-environmental schemes need lump-sum government transfers for these activities and are otherwise dependent on off-farm employment, which is confirmed by our findings. The explored differences across types illustrate the complex interdependencies of factors that have to be taken into account when inferring on farmers’ reactions to changes in the CAP and steering diversification decisions in a desired direction for public and private investments.

When looking only at surviving farms, the propensities for off-farm diversification see the largest increases. However, a general increase in all diversification activities as a response to the loss of financial support demonstrates that diversification can be interpreted as a survival strategy as has been found in other studies (López-i-Gelats et al., 2011; Meert et al., 2005). Carrying out additional on-farm activities does not show strong dependency on the policy scenario, as found by Pieniadz et al. (2009), suggesting curbing effects of the overall CAP instrument, which is dominated by production-oriented single farm payments. The shifting of financial resources to rural development measures in the current funding period 2014-2020 represents an important step in this regard.

Conclusion

The alteration of political framework conditions that affect farm adjustment strategies have been current issues in European rural development policy. Despite a comparably long history of valuable research on topics such as diversification and structural change, the evidence based on theoretical models of farm households' utility largely refers to in-depth investigations of single factors in specific case studies. This study takes a broad empirical approach based on a survey of 2,154 farms from eleven European regions. It compares choices to allocate labour resources on and off the farm including a complete shutdown of agricultural production under two contrasting policy scenarios. We observe a strong tendency of rising exit rates as it is reported by farmers in relation to the termination of CAP support. At the same time on and off-farm diversification as a survival strategy among farms that decide to continue their farming activity is observed. In order to disentangle the complexity of determining factors, we developed and applied a joint approach of factor and cluster analysis to determine farm types showing distinct behavioural patterns. The distinguished six clusters exhibit types of different robustness to the loss of market support, and varying propensities to diversify for surviving farms. So far, relatively unknown types, such as intensive livestock professionals, show a strong tendency to continue agricultural production with low propensity to diversify independently of the policy scenario. In contrast, young organic farm households have a high propensity to diversify on farm but strongly depend on market support. The patterns revealed by the farm typology and the benchmark scenarios show that the interrelation of many different factors is relevant to determine farmers' reactions to changes in the CAP, and common trends are not likely in the heterogeneous European farm population. Information specific to certain types is therefore relevant in order to develop targeted rural development policies that are tailored to the specific needs of beneficiaries.

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