

Multifunctionality of Farms – the Effects on Land Use Change

Zofia Sawicka*, Natalia Ratajczyk**

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One of the main goal of the rural development researches is to find such trajectories which have positive impact on human welfare without negative effects on natural resources. In this paper we investigate, if multifunctionality of farms can be a sustainable development trajectory, focusing on land use. The aim of the study is to show links between different development paths and their impact on land use intensity at the farm household level. The research bases on the 30 structured in depth interviews conducted in Bavarian Mittelgebirge – Germany, during which the farmers or former farmers reported the 60 years farm's history. The results show the general trend to extensify land use and prove that the larger farms are more active in provision of new function than their peers with smaller farm size. The broadening strategy is the only multifunctional form which ensures the extensive land use approach. This retrospective study can be useful for regions with fragmented agriculture, big share of family farms and highland landscape like south Poland, Rumanian or Slovak highlands, where the natural constraints in agriculture encourage to search for such development paths, which do not exceed the environmental limits while ensuring the socio-economical welfare of inhabitants.

Keywords: multifunctionality of farms, land use, fragmented agriculture, Bavaria.

Wielofunkcyjność gospodarstw rolnych i jej wpływ na użytkowanie gruntów

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Jednym z głównych celów badań nad rozwojem obszarów wiejskich jest znalezienie takich ścieżek rozwoju, które z jednej strony poprawiają jakość życia mieszkańców, z drugiej zaś – nie nadwyrężą zasobów naturalnych. W artykule sprawdzamy, na ile wielofunkcyjność gospodarstw rolnych jest zrównoważoną ścieżką rozwoju dla obszarów wiejskich głównie w kontekście użytkowania gruntów. Celem artykułu jest przedstawienie zależności między różnymi ścieżkami rozwoju obieranymi przez gospodarstwa a intensywnością prowadzonej przez nich gospodarki gruntami. Badanie przeprowadzono w oparciu o 30 ustrukturalizowanych wywiadów pogłębionych, w których właściciele lub byli właściciele gospodarstw relacjonowali 60-letnią historię swojego gospodarstwa. Wywiady przeprowadzono w Bawarii (Niemcy) na obszarze Mittelgebirge. Wyniki badania potwierdzają ogólny trend do ekstensyfikacji gospodarki gruntami

* **Zofia Sawicka** – PhD, Faculty of Management, University of Warsaw.

** **Natalia Ratajczyk** – PhD, Department of Geobotany and Plant Ecology, Faculty of Biology and Environmental Protection, University of Łódź.

Correspondence address: Faculty of Management, University of Warsaw, Szturmowa Str. 1/3, 02-678 Warszawa; e-mail: ZSawicka@wz.uw.edu.pl; nataliat@biol.uni.lodz.pl.



w rejonie i pokazują, że większe gospodarstwa są bardziej aktywne w obszarze dostarczania nowych funkcji (także pozarolniczych) niż ma to miejsce w gospodarstwach mniejszych. Jednocześnie wyniki wskazują, że strategia „poszerzania” działalności jest jedyną formą wielofunkcyjnego rozwoju gospodarstw, która przekłada się na ekstensywną gospodarkę gruntami. Przedstawione retrospektywne badanie rozwoju gospodarstw może być użyteczne głównie dla regionów z rozdrobnioną strukturą agrarną, dużym udziałem gospodarstw rodzinnych i pagórkowatym ukształtowaniem terenu, jak ma to miejsce np. w południowej Polsce, i pagórkowatych obszarach Rumunii czy Słowacji, gdzie naturalne ograniczenia w rozwoju rolnictwa zachęcają do poszukiwania ścieżek rozwoju, które nie nadwyrażają zasobów środowiskowych, będą przyczyniały się do podniesienia dobrobytu społeczno-ekonomicznego mieszkańców.

Słowa kluczowe: wielofunkcyjność gospodarstw rolnych, użytkowanie gruntów, rozdrobniona struktura agrarna, Bawaria.

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1. Introduction

Multifunctionality (MF) is a widely accepted paradigm of rural development. The core of this concept is the evolution of rural areas from places generating only agricultural produce to sites providing a range of commodity and non-commodity values (Ploeg & Roep, 2003; McCarthy, 2005; Renting et al., 2009; Barbieri & Valdivia, 2010; Almsted et al., 2014; Brouder et al., 2015). The intensification of agricultural production and the liberalization of food markets put strong pressure on competition in agriculture, demand greater work efficiency and release labour for non-agricultural activities. Therefore, from the economic point of view, the multifunctional development of rural areas is an essential process (OECD, 2001; Renting et al., 2009; Barbieri & Valdivia, 2010) that helps rural communities face an uncertain future (Ploeg et al., 2009). However, in addition to economic issues, search for sustainable development paths is currently the object of great interest. Following on from the joint statement of the World Academies Conference “Transition to Sustainability in the 21st Century”, the question arises of whether multifunctionality can be an *alternative concept for guiding action towards a sustainability transition* (Kates et al., 2001, p. 3), which would allow various types of natural resources to be managed in such a way that they may be used to provide ecosystem services, and thus have a positive impact on human welfare (Constanza et al., 1997). This question places the question of MF within the framework of sustainable development, as observed by Renting *et al.* (2009) Ploeg et al. (2009).

One of the key elements of sustainability is land. The effects of land cover and land use on long-term sustainability are broad, affecting the land’s capacity to fulfil production, ecological, sociological and cultural functions. Changes in land use influence a range of essential environmental factors, including climate change, water balance, biodiversity and soil quality

(Foley et al., 2009). The cultural and sociological functions of land are broadly discussed in literature and range from sustaining the landscape to nostalgic values (Bergstrom et al., 1985; McCarthy, 2005; Almsted et al., 2014). Assuming that the long-term impact of land use has ramifications on human welfare, the 'safe limits' of this change need to be identified to ensure sustainable development (Kates et al., 2001). However, another course of action is to identify development trajectories which offer the same economic and social benefits without having a negative impact on natural resources (Foley et al., 2009). Rural development trajectories can have a crucial influence on future land use change and, hence, on global sustainability.

With this in mind, Mather et al. (2006) suggest that the role played by societal change as a driver for land use change in post-productivist rural areas is an area for further development. As MF is one of the key characteristics of societal change, its relationships with environmental externalities (McCarthy, 2005; Renting et al., 2009) and location (Brouder et al., 2015) should be examined. Elsewhere, Wilson (2008; 2009) situates MF within the sustainability framework. Developing the weak-moderate-strong MF concept, he argues that strong MF is associated with strong social, economic, cultural and environmental capital, the latter being a key element of MF.

2. Levels of Multifunctionality

Academic discourse presents few categorizations of MF levels. From the perspective of geography, MF can be conceptualised at farm – rural community – regional – national – global levels (Wilson, 2009), while Knickel and Renting (2000) consider it in terms of farm – farm household – region – global levels. Renting *et al.* (2009) emphasize the important role of farm development trajectories and add two levels: the activity and the field.

As our present study is focused on the local level, we make a distinction between agriculture – farm – farm business and land use. In this case, the most basic level is the multifunctionality of agriculture. It can perform a number of functions, ranging from commodities (food, energy, fibres) to non-commodity goods, and incorporating environmental, cultural and sociological outcomes (e.g. provision of work, agricultural landscape, rural lifestyle, local identity, biodiversity) (Renting et al., 2009; Wilkin, 2010). The next level is the multifunctionality of the farm, which rests on decisions made by individual farmers. This aspect influences not only the diversity of income sources enjoyed by the farmer, but also the farm's ability to fulfil new functions. The choice of development strategy made by the farmer may enable the performance of certain functions for local communities, such as recreation, education or landscape management (Renting et al., 2009; Barbieri & Valdivia, 2010). In addition, the expansion of non-agricultural

activities can broaden the range of new entrepreneurial intended to meet local demand.

All utilities provided at the level of a single farm influence the environmental, sociological and economic dimensions of land use (Pérez-Soba et al., 2013). Higher up, developmental decisions made by individual farmers that affect land use (Vliet et al., 2015) have an aggregate impact on functions performed on the local and regional level (Knickel & Renting, 2000; Renting, 2009).

3. Forms of Farm Multifunctionality and Land Use

As Mather et al. (2006) emphasize, MF can be a key driver of land-use change in rural areas. The considerable role played by this factor is based to no small extent on the opportunity cost theory. This theory, involving the calculation of the best forgone alternative, has been broadly adopted to estimate the cost of conservation for different stakeholder groups and for the national economy (Plantinga & Miller, 2001; Adams et al., 2010; Golub et al., 2009; White & Minang, 2011). Regardless of whether the common land use is forest or agriculture, the calculation of opportunity costs should assume two possible strategies: the intensification and the extensification of land use. As Erb et al. (2013) note, the intensity of land use has usually been measured as input to or output from the production system. Assuming that the area of land is constant, intensification based on a greater input, in the form of labour or capital, allows the system to generate more products or services (Erb et al., 2013). However, after a 'sustainable transition', the trade-off calculation cannot be limited to the simple input-to-output ratio. The intensification process affects ecological patterns which should be integrated into the system.

Regarding agricultural land use, the most established indicator describing both the input-to-output ratio and the capacity of land to produce non-commodity goods, is the level of human appropriate net primary production, which quantifies human impact on the annual flow of the amount of biomass produced by plants in a year (Fetzel et al., 2014; Gingrich et al., 2015; Sluis et al., 2015). There are also other indicators, such as energy return on investment and life cycle assessments, summarized by Erb et al. (2013), which contribute to the concept of land use intensification in agriculture and forestry. An intensification trajectory which allows higher outcomes to be achieved while maintaining non-productive functions of land to be performed is defined as 'sustainable intensification'. This term is established not only in academic discourse (Erb et al., 2013), but also in European political discourse (EU, 2013).

At this point, it is important to consider an important linkage between land use and farm multifunctionality. In general, this development strategy results in a better management of farm resources, thus increasing farm

revenue and affecting the opportunity cost calculation. However, as different patterns of farm multifunctionality exist, which affect land use in various ways, a categorization of multifunctionality at farm household level is needed to allow a greater understanding of the interconnections between multifunctionality and land use change.

In response, academic discourse presents a range of classifications intended for systematizing the complex issue of farm multifunctionality. The most general term describing this phenomenon is probably the 'farming style'. This demonstrates a particular farming practice, and can be categorized on the basis of such indicators as workforce structure, productivity and diversity of production. To cover the majority of farms in a given region or country, over a dozen 'farming styles' need to be identified (Ploeg et al., 2009, p. 126). However, while this concept gives a detailed insight into the farming practices of a given region, it cannot be adopted for inter-regional analysis as the crucial differentiating characteristic may not be shared by individual regions. For this purpose, Ploeg and Roep (2003) propose a more universal grouping of farming styles. They identify farm strategies based on deepening, regrouping and broadening of farm activities. This approach has a lot in common with the specialization and diversification at farm level (Hansson et al., 2010).

Assuming that the specific nature of farms is entrepreneurial, they are based on the principle of a strategic market approach with focus on the diversification-specialization dilemma (Simon, 2009). It should be pointed out that specialization in the modern sense entails not only focus on the core farm enterprise (Hansson et al., 2010), but also a strategy that enables cost reduction through the mobilization of resources (Ploeg & Roep, 2003) by economies of scale or economies of scope. While specialization does not directly lead to the provision of new functions for society, and thus is not evidence for a multifunctional or a post-productivist transition, it can have some impact on the local economy through the multiplier effect (Knickel & Renting, 2000). It can lead to an intensification of agricultural land use which, as confirmed by many studies, reduces the range of functions (outcomes) performed for the local community (Foley et al., 2005; Erb et al., 2013). On the other hand, specialization, which allows more to be gained from agricultural activity, makes the conversion of land use from agricultural to developed, and farmland abandonment less likely to occur, as the opportunity-cost calculation shows less deviation between agricultural and developed uses.

The literature affords a great degree of attention to the diversification strategy of farms (Ploeg & Roep, 2003; Ploeg et al., 2009; Hansson et al., 2010). This concerns multiple activities within the farm, and can be described as 'farm business' (Hansson et al., 2010, p. 270). When analysing a diversification strategy, it is necessary to distinguish between diversification based on on-farm and on off-farm resources. In turn,

on-farm resources can be regarded as diversifying either within the primary sector or outside of it.

Diversification within the primary sector is achieved through additional ventures in conventional agriculture production (Hansson et al., 2010), but also activities such as organic farming, high-quality production, or the creation of short supply chains. Ploeg and Roep (2003) describe this mode of diversification as a ‘deepening’ strategy, pointing out that it entails more value added per unit and it better fits the demands of society at large. The range of goods produced can also be supplied to new markets and to different levels of agro-food supply chains. This strategy of diversification, despite focusing on the primary sector, can serve new functions at the local level through the direct marketing of agricultural products, or provide a sociological function through the supply of regional products, thus strengthening local identity. Diversification within the primary sector can be a form of sustainable intensification of land use. This development path allows more added value to be gained from one unit of land without reducing its ecological functions. The generation of greater profits by the farm ensures that the opportunity cost of artificial use will not exceed common land use and that the conversion of land use to non-agricultural uses is less likely to occur.

Another form of diversification by on-farm resources concern activities outside the primary sector. The simplest way in which to ensure such is to rent out farm buildings or equipment, where ‘resources are used in essentially the same way, but revenues are attained from new markets’ (Hansson et al., 2010, p. 272). However, resources can be reorganized and involved in other activities, such as agri-tourism, production of energy or landscape management. The crucial point of this ‘broadening’ trajectory (Ploeg & Roep, 2003) is its connection with agriculture (McCarthy, 2005). Although products or services are not addressed at the primary sector, customer value often depends on the eco-services provided by agriculture. This phenomenon is best described by the post-productivist concept, which states that the ‘core characteristic is a change in relative emphasis from commodity to non-commodity outputs’ (Mather et al., 2006, p. 443), and serves as a response to the rising demand for non-commodity goods provided by agriculture. Recent studies have demonstrated this social shift, which has occurred in various parts of the world, and also has an impact on land use. The reduction of human appropriate net primary production (HANPP) demonstrates that the extensification of agricultural land use is possible (Fetzel et al., 2014; Gingrich *et al.* 2015; Sluis et al. 2015), although it often leads to greater energy use and other economic costs (Krausmann et al., 2012).

The two final development trajectories (off-farm enterprise and off-farm work) are based on labour and knowledge, which are connected with the farmer and his/her family members. These trajectories boost the flow of income of the family household, but do not directly depend on the resources or services provided by agriculture. Though the off-farm enterprise can

perform new functions for society and, consequently, contribute to the multifunctionality at the local level, in contrast to off-farm work, the two strategies can have a similar impact on land use. If the agricultural land stops being the single source of income, the pressure to adapt it to artificial uses increases. On the other hand, farmers can engage in other activities that increase their income; they can become hobby or lifestyle farmers, which leads to extensive land use, as observed in some European countries (Wilson, 2008; Sluis et al., 2015); however, this development path can negatively affect local sustainability. Wilson (2008) argues that these types of farms tend to be relatively less locally embedded, which leads to an erosion of local knowledge and traditions (Bohnet et al., 2003; after Wilson, 2008). Farmland abandonment is also likely to occur as neither work nor entrepreneurship are linked with agriculture. Examples have been given of the disintensification of agricultural land use; these being manifested as contraction, with only few percent reported as less intensive agriculture activity (Vliet et al., 2015).

		Intensification of land use in form of			Extensification of land use in form of	
		Agricultural land use	Developed uses	Sustainable intensification	Farmland abandonment	Agricultural land use
deepening	Specialization	yes	no	no	no	no
	Diversification within primary sector	no	no	yes	no	no
broadening	Diversification outside of the primary sector, on-farm resources	no	no	yes	no	yes
regrounding	Off-farm work	no	yes	no	yes	yes
	Off-farm diversification	no	yes	yes	yes	yes

Tab. 1. Forms of intensification and extensification of land use. Source: own study.

The above list of different possible links between farm multifunctionality and land use reflects the complexity of this issue (Table 1). Apart from socio-economic effects, MF will have an impact ‘on the ground, in terms of land use’ as emphasized by Mather et al. (2006, p. 454). This ‘ground’ is, first and foremost the decision-making unit, the farm (Renting et al., 2009). Also, Wilson (2009) notes that the most important spatial scale for MF is the farm level, where it finds its direct expression.

The aim of this paper is to examine the impact of farm development trajectories on land use change at the farm household level, taking into account the links between MF and land use change. Not only does the study address the gain or loss of UAA, but also the sustainability issue in terms of land use intensity, which is often missing in studies of land use change at the farm level (Renting et al., 2009). The results represent a step forward in research on sustainable rural development theories and in the quality of life at the local level.

4. Study Area

The study area is located in the Bavarian *Mittelgebirge*. It is a highland area in south-east Germany, part of the Bohemian Massif of the Czech borderland. Its highest points reach 1,000 m above the sea level and the area was not glaciated during the last ice age. Crystalline igneous and metamorphic rocks predominate in the area, with 90% of gneiss and granite (Kornkrumpf, 1948). The study area consists of 10 municipalities within the Bundesland Bavaria, the eastern part of Oberpfalz and the northern part of Niederbayern subregions. This area was selected for the purpose of research on multifunctionality and land use change on the household level for the following reasons:

1. Limiting the analysis to the local level ensures – to a great extent – that the *ceteris paribus* rule is observed. As many studies report, the most important drivers of agricultural land use change are accessibility, population density, GDP growth, land prices, farm size (Asselen & Verburg, 2013; Mazzocchi et al., 2013; Rasmussen & Weber, 2013; Ustaoglu et al., 2016; Guiomar et al., 2018). All these variables, with the exception of the last, are the same in such a small study area, which enables multifunctionality to be isolated as the key driver of land use change.
2. Fragmented agriculture. In 1949, the average UAA of a farm in Bavaria was 5.1 ha (LB 1949), while in Germany it was 8.06 ha (Seidl, 1995). While 70% of Bavarian farms had a UAA below 5 ha in 1949 (Bayerisches Statistisches Landesamt, 1952b), this was true for only 18.5% of German farms (Bayerisches Statistisches Landesamt, 1952a). In addition, as Schlögl (1954) reports, agricultural parcels were dispersed over the entire community, which made work on the farm very time- and labour-consuming (Ploeg et al., 2009, p. 125).
3. The importance of the primary sector. In 1949, agriculture was the main source of income for over 36% of the population of Bavaria, while the livelihoods of 30% depended on industry and handcraft (Bayerisches Statistisches Landesamt, 1952b). For Germany as a whole, these figures were 23.5% and 43%, respectively. Nevertheless, while 15.3% of Bavarian GDP in 1950 was created by the primary sector, in Germany it stood at 10% (Eichmüller, 1997).

4. A large share of less favoured areas. This percentage varies from 32% to 63% in the community area (Würfl, 1984). All surveyed farms were located within LFAs.
5. Periphery location. All 10 communities are located more than a 60-minute drive away from the nearest large city (Regensburg, 140,000 inhabitants), near the national border which, until 1990, coincided with the Iron Curtain.

In short, these communities did not have any evident function that could determine their development. Natural and structural conditions for agricultural development were adverse. The location created strong constraints for the development of the agro-food supply chain, while the impact of the distant 'centre' was limited. In addition, the area could not easily compete in the tourism sector. Although it had some natural agritourism potential, it was never a first-choice destination that could successfully compete with the nearby Alps or the German seaside.

5. Aim, Data and Methods

The study aimed at showing the effects of the chosen development trajectory of farms on their land use pattern. The exercise focuses on examining how development strategies differ between small and medium-size farms, and how the development trajectory affects the land's potential to provide production, ecological, sociological and cultural functions.

The study is based on an analysis of *land use and actor-oriented approaches* (Renting et al., 2009, p. 115, 116). The data for the analysis comes from 30 semi-structured in-depth interviews conducted in Bavaria, Germany in 2006/2007. A similar interview format was used by Barbieri and Valdivia (2010) in a study showing synergies between MF in recreational services and the land use practice in the form of agroforestry. Interviews conducted in the present study addressed the 60-year history of farms during the period 1945–2005, focusing on utilised agricultural area (UAA) change, land use intensity and farm development strategies. As empirical data were gathered over 10 years ago, the study presents a historical view of the discussed issues.

The analysis was conducted in four stages (Table 2).

First, a group of 30 households were selected. To highlight different development trajectories, ten households were selected from each of the following three groups (2005): 10 households where agricultural activity was the main source of income, 10 households where agricultural activity represented less than 50% of income, 10 households which conducted agricultural activity until at least 1970, but for which it was not a source of income in 2005. This sample included households whose future was uncertain. As Ploeg et al. (2009) reports, although the future of small-scale or part-time farmers in the Netherlands and France was particularly uncertain and they were predicted to vanish, many remained in agriculture and empirical studies show a great diversity of development trajectories.

Stage of analysis	Method	Indicator	Values
Selection of 30 farms	Nonprobability sampling	Share of income from agricultural activity in 2005	Over 50%, less than 50%, no income from agricultural activity
Distinction between small and large farms	Allocation by farm size (Guiomar <i>et al.</i> 2018)	UAA in 1945	2-14 ha; 15-30 ha
Assignment of MF forms	Three forms of MF (Ploeg and Roep 2003)	Reported activities among farm household members	Deepening/ specializing, broadening, regrouping
Description of land use change	Land use intensity (Erb <i>et al.</i> 2013, Vliet <i>et al.</i> 2015)	Participation and planning to participate in the agri-environmental scheme, UAA change	Intensive land use – no agri-environmental scheme, extensive land use – agri-environmental scheme

Tab. 2. Data and methods. Source: own study.

In the second stage of analysis, farm households were divided into two equal groups according to their initial (1945) UAA. The first group consisted of farms with a UAA of 2–14 ha and the second of farms with 15–30 ha. The distinction between ‘small’ and ‘large’ farms is necessary because, as many studies report, farm area is an important microeconomic driver for agricultural land conversion (Mazzocchi *et al.*, 2013; Terres & Nisini, 2013; Wojewodzic, 2014). While analysing the effects of farm multifunctionality on land use change, the group of farms should be as homogenous as possible to exclude the impact of this factor on the analysed change. On the other hand, the presence of fewer elements in the groups would make any synthesis impossible.

The third step of the analysis was based on the concept developed by Ploeg and Roep (2003), who have defined three forms of multifunctional development at farm enterprise level: broadening (B), regrouping (R), and deepening (D). Broadening entails the development of on-farm activities, such as agritourism or energy production. Regrouping refers to strategies where ‘farm enterprise is grounded in a new or different set of resources and/or involved in new patterns of resource use’ (Ploeg & Roep, 2003, p. 7), with the most common form of this approach being off-farm income. The third strategy, described as ‘deepening’, refers to the transformation of agricultural activity in order to generate more value added per unit. Although authors refer to such forms of deepening as organic farming or high-quality production, in our analysis, we define it more loosely and

include a simple specialization: a strategy which focuses on the main farm enterprise (Hansson et al., 2010). If a farm had a specialization, we asked about relevant investment; it was qualified as positive if investments were present in assets supporting the chosen specialization. The B/R/D strategies were assigned according to a given activity initiated at a certain point in the past and continued until 2005 or until the time when the household gave up its agricultural activity. In some cases, the form of B/R/D was found to change, but the strategy remained: for example, the farmer shifted from specializing in potatoes to milk.

The final step of the analysis was based on the concept of land use intensity, developed by Erb et al. (2013), and on the manifestations for agricultural land change by Vliet et al. (2015). Adapting these two conceptual frameworks for Bavarian farms in the long-term, land use patterns were divided into three groups: intensive intensification, sustainable intensification, and extensification. Both intensifications were based on the specialization reported in the interviews which lead to an improved input-to-output ratio.

In sustainable intensification, the provision of non-productive functions is maintained. In our analysis, sustainability is reflected as household participation in agri-environmental schemes, which cover at least two elements of system properties described by Erb et al. (2013): biodiversity and complexity of the ecosystem. These indicators are also in line with research on post-productivist trends described by Mather et al. (2006). In addition, Adu-Acheampong et al. (2016, p. 52) emphasize that ‘while agriculture is known to adversely affect biodiversity, if good management practices are observed, they may be able to benefit biodiversity...’. Assuming the agri-environmental program entails good environmental practices, it is a suitable indicator for distinguishing between sustainable and unsustainable forms of agricultural land-use.

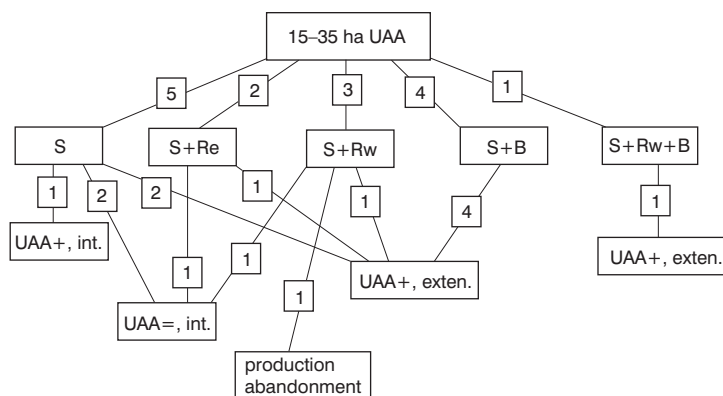


Fig. 1. Different development strategies of larger farms. Source: own study.

Some of the interviewees declared their participation in such schemes, but emphasized that they had decided not to apply for financing in the next programming period in order to gain more freedom and intensify their agricultural production; this indicator excludes household with intensification plans, and was therefore defined as ‘participating and planning to participate in the agri-environmental scheme’. The second type of agricultural land change is disintensification. It is observed in two cases. The first case can be referred to as production abandonment, meaning that the household had stopped conducting agricultural activity at some point between 1970 and 2005. The second case included farms participating in an agri-environmental scheme without any specialization in agricultural activity, which leads to the provision of more system properties with a constant input-to-output ratio from the land.

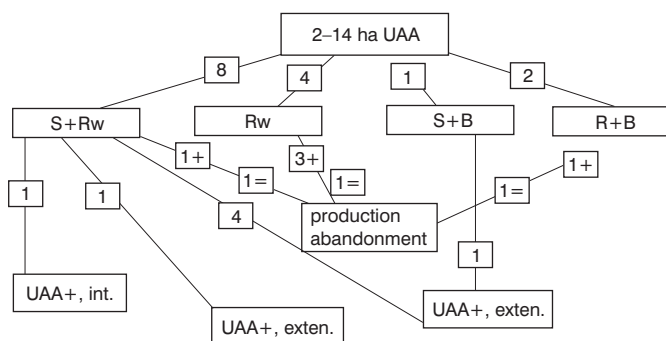


Fig. 2. Different development strategies of smaller farms. Source: own study.

6. Discussion

Although the R/D/B grouping is intended to simplify the complex issue of farm strategies, the analysis reveals considerable variety of combinations of the three aspects. This resembles the findings of Ploeg et al. (2009), who reports a similar spectrum of farming styles. In terms of the chosen development path, the only general trend that emerges is that all larger farms chose to specialize, while six of the 15 smaller farms did not declare any evident specialization path.

The interviewed farms indicated three possible specialization trajectories: milk production (*cow man*), potato production on the basis of a long-term contract with a potato crisp manufacturer, or potato production followed by a shift to milk production after the fall of potato prices (1990). The ‘potato trajectory’ – is a good example of what was described as deepening by Ploeg and Roep (2003), as it shortens the food-supply chain by building common potato storage areas to ensure constant supplies to crisp manufacturers.

One weakness of this development path was the farm's vulnerability to lower potato prices in the nearby Czech Republic after 1990. Some farms decided to invest in milk production or to diversify into an off-farm base. This link between specialization and 'staying' in agriculture demonstrates the truth of the oft-quoted statement that 'vanguard farmers' are able to stay in agriculture (Ploeg et al., 2009, p. 125). This confirms previous findings on success drivers of companies in general, which show the importance of 'deepening'. On the basis of an analysis of 500 cases of companies throughout the world, Simon (2009, p. 70) notes that one of the key elements of success of his 'hidden champions' was the 'depth' of their range of services, which was demonstrated by the number of variants of the same product, the completeness of a solution to a problem, or the value chain covered. Although, as Wilson (2008) reports, specialized farms offer less transition potential into MF, our findings demonstrate that without this strategy, farms are likely to vanish, and so their potential to provide a function connected with agriculture will disappear. The specialization can be defined rather as 'deepening', indispensable is agriculture is to remain a source of income. Our findings suggest that specialization has a greater impact than farm size on pursuing agricultural activity, which is in line with the results of Ploeg et al. (2009), who claim that the disappearance of all small firms is not inevitable. The smallest farm from the research group had a UAA of 6 ha in 2005. Still, farm size will always have an indirect impact on production abandonment, as it affects the farm's specialization potential.

In addition, results show that although farmers who want to 'stay in agriculture' should develop a specialization or a deepening strategy, they can do so without broadening or regrounding only if they have a large enough farm. None of the small farms lacked an R or a B strategy, while six large entities declared agricultural production to be their main source of income.

Diversification strategies differ significantly between the two groups of farms. While farmer pluriactivity was observed in the form of paid work in 12 small farms, this was the case of only four larger farms. The other method of regrounding, i.e. diversification in the form of an enterprise based on off-farm resources (e.g. information services) was observed in two large farms, but in none of the small farms with their business centred around on-farm resources. Large farms were also more actively engaged in broadening strategies: five large farms and three small farms chose to diversify by setting up a business based on on-farm resources such as agritourism, machinery lease, mechanical engineering, timber or catering services.

These findings are in line with those of Wilson (2008), showing that large farms have more MF potential than small entities. In total, 10 of the 30 examined farms set up their own business, the most expected form of multifunctionality, leading to the provision of more products or services for the community (Ploeg & Roep, 2003; Ploeg et al., 2009), most closely

resembling what is known as ‘strong multifunctionality’ (Wilson 2008) or the ‘working landscape’ in America (McCarthy, 2005, p. 775). Entrepreneurship in the group of large farms resembled that observed in a study in Sweden, which confirmed that farm size had a significant impact on the degree of diversification outside traditional agriculture (Hansson et al., 2010).

The analysis reveals various links between farm development paths and land use change. The first general conclusion is the tendency to engage in extensive land use. Fourteen of the interviewed farms reported this approach, while another six declared intensive land use. The remainder had abandoned agricultural production, sold or leased their land; in this case, land use intensity could not be monitored, but the farms were at risk of farmland abandonment or conversion to developed use.

This trend towards disintensification confirms the findings of recent studies showing the extensification process in Europe (Gingrich et al., 2015; Sluis et al., 2015; Vliet et al., 2015). In addition, the analysis shows that intensive land use is more typical of large than of small farms. Intensive land use was reported in a single small farm and in five large farms. Three of these large farms followed the ‘only specialization’ path, indicating a market approach leading to land use intensification. Indeed, statistical data confirms that in Bavaria, farms whose sole or main income source were agricultural activities benefit from a lower share of public support with regard to income than farms with diversified income sources (Bayerisches Staatsministerium für Landwirtschaft und Forsten, 2006).

Other farms which reported intensive land use followed the specialization-plus-regrounding trajectory. Results show an evident link between the broadening strategy and land use change. None of the eight farms that followed the broadening path reported intensive land use, which suggests that diversification based on on-farm resources leads to extensive land use. This conclusion contributes to studies on post-productivism (Mather et al., 2006): the broadening strategy reflects a shift from productive to non-productive functions and ensures extensive land use, which provides more environmental services. This finding is also in line with the results of Barbieri and Valdivia (2010), who point to synergy between recreational functions of farmland and agroforestry practices. Two points must be stressed here: firstly, only eight of the 30 farms followed the broadening strategy; secondly, only two of these farms abandoned agricultural production, and consequently lost their influence on land use intensity. This was the case of farms which did not specialize in agricultural production.

Apart from land use intensity, another important element influencing MF was the change in farm size. 20 of the analysed farms increased their UAA over the period between 1945 and 2005, while 10 reported constant UAA. It should be stressed that only three among the 10 farms which did not increase their UAA also abandoned agricultural production; other farms that abandoned production increased their UAA and eventually reached

a size of 6–45 ha. It should be mentioned that increase was observed until 1970 – a period when, according to the interviewees, many still hoped to maintain agricultural activity and Bavarian industry could not provide sufficient employment opportunities for ex-farmers. Hence, in the case of five of the 20 farmers who decided to increase their farm size (UAA), efforts failed to bring the expected results and agricultural production was eventually abandoned. Only one of these farms developed a broadening strategy based on on-farm resources through the lease of machinery. The remainder moved to off-farm work, and therefore did not directly use their agricultural assets. These farms limit the supply of agricultural land available for more competitive farms that are planning to expand and grow.

The second important conclusion refers to farms that did not increase in size. Six farms maintained their UAA unchanged and continued agricultural production until 2005. Four of them declared intensive, and two extensive land use. Only two among the 20 farms that increased their UAA claimed to use their land intensively, which testifies to the fact that intensive land use is more likely in the case of farms with no expansive land strategy than in the case of farms that intend to grow in size. Although land increase may be recognized as the intensification of land use (Vliet *et al.* 2015), it can also be a means to achieve sustainable intensification, if it is combined with increased provision of eco-services (agri-environmental programs) (Erb *et al.*, 2013).

In discussing the rationale for the presented cases of Bavarian farms, we should refer to the question formulated by Ploeg *et al.* (2009): Can development strategies travel? Although initial rural studies focused on inter-regional differences, given that globalization enables the spread of technology and institutional arrangements, at least within the European Union (Ploeg *et al.*, 2009), some conclusions could be exported to other regions. Specific development drivers of the Bavarian Mittelgebirge make this area an interesting case for comparative retrospective studies aimed at identifying development trajectories for less-developed regions with similar natural and structural constraints (Sawicka, 2013). While it is difficult to find global trajectories of rural change (Ploeg *et al.*, 2009), Almsted *et al.* (2014, p. 303) suggest ‘exchange of development paths and different land use patterns in developed and developing regions’. Assuming that the Bavarian countryside developed primarily in response to the German *wirtschaftswunder* and other exogenic economical drivers (Eichmüller, 1997; Siebert, 2005), its development trajectory can still serve as a useful example for regions with fragmented agriculture, a large share of family farms and mountainous terrain.

This area has similar characteristics to the regions of southern Poland, where a large number of small farms are at risk of production abandonment (Musiał, 2008). As Jadczyzyn and Rosner (2013) report, mountainous regions are at a lower risk owing to greater diversification possibilities

(broadening); successful development trajectories are much more difficult to define for small farms located outside of regions that may be attractive to tourist (Wilson, 2008; Jadczyzyn & Rosner, 2013). A similar situation is observed in Slovakia. Lieskovský et al. (2015) report that only 50% of the traditional mosaic agricultural landscape is regularly managed and the off-farm work of the majority of farmers does not ensure the continuation of agricultural production. The search for sustainable development trajectories for small farms is also crucial in many areas in Romania. In 2010, 98% of holdings had a UAA below 10% and they operated on 39% of the farmed area. Taking into account that 75% of Romanian holdings are not eligible for direct payments (Alexandri & Luca, 2012), it is clear that their future depends not only on their consolidation, but also on development paths that will enable their deepening, broadening and regrounding.

While the need for MF transition in these regions is evident, it should be pointed out that MF pathways are not evenly accessible, as their exogenic drivers create narrow corridors for decision making (Wilson, 2009). For this reason, the example of Bavaria is more suitable for the purpose of advising policy makers at the EU, national and regional levels. Dufour et al. (2007) emphasize that although the concept of MF has had much greater success with the agricultural administration than with French farmers themselves, organizational support plays an important role in transition towards multifunctionality.

The lack of such structures can be an important constraint in the process of transition to MF in developing countries. The model constructed by Asselen and Verburg (2013) predicts large areas of land use intensification in Eastern Europe by 2040. As these regions have no incentives for extensive land use, intensification can be the only way to compete on the agricultural market. The risk of farmland abandonment within the mosaic agricultural landscape combined with the intensification process demands a search for suitable development paths that will ensure the socio-economical welfare of the inhabitants of these regions, yet without exceeding environmental limits.

7. Conclusions

The analysis of the thirty cases demonstrate development trajectories of small farms, focusing on links between multifunctionality and agricultural land use change. Results show that the most desirable farm development path combines specializing with broadening. While specializing is necessary if the agricultural production is to be continued, with non-specialist farms eventually abandoning production, broadening is not only the core of what ought to be expected from farm multifunctionality (OECD 2001, *Ploeg et al.*, 2009; Renting *et al.* 2009), but it also ensures extensive land use. Referring to the post-productivist paradigm, it can be concluded that the productive approach to agricultural activity promotes post-productive use

of land. This is confirmed by Almsted et al. (2014), who note that the process of productivism in the form of specialization, combined with post-productivism in the form of extensive land use coexist within the rural landscape. Also Wilson (2009) argues that farmers can apply non-productivist and productivist strategies for different areas of farm activity. Expansive land approach seems not to be evidence of land use intensification, as farms which have not increased their size for over 60 years were more likely to declare intensive land use than farms with UAA increase. In addition, large farms were more likely than small farms to develop in the S+B direction, which seems to be the most sustainable trajectory.

These conclusions show a clear need for further research on the design of agricultural support for Eastern European countries with its fragmented agriculture. Specialization, implying a deepening with regard to quality, organic food or short supply chains, seems to be an essential condition for any farms planning to pursue their agricultural activity. We can conclude that MF can be a concept for guiding action towards a sustainability transition, if land is managed by farms with gainful deepening strategies and successful broadening ideas that ensure the provision of eco-services by the agricultural land.

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