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Comparative analysis of territorial impacts of multifunctional agriculture

Abstract: Due to the increasing priority orientated towards more integrated policy concepts, such as rural development policy, there is a growing need to address the concept of multifunctionality for policy assessment. In particular, the dependence of the various tasks and services provided by agriculture on the territorial contexts is a key issue in valuing adequately the potential of agriculture and forestry in diverse types of rural regions. These questions were therefore the main aims of EU FP6 research project TOP-MARD [2] which tried to develop the concept of multifunctionality as a rural development policy instrument that is sensitive to economic, social, cultural, environmental and geographical context. The project was designed to analyze how the various functions of the agricultural sector in any given territory affect the sustainable economic development and the quality of life of that territory, and how different policies affect these relationships. In a sample of 11 EU countries specific study areas were selected to explore the diversity of multiple functions, co-production, and impacts on rural development across Europe. One of the main objectives and outputs of the research project was to improve our knowledge about the relationships affecting multifunctional tasks. A core project deliverable was to characterize these driving forces and interrelations in a policy model (called POMMARD) which would allow the simulation of the dynamic economic, social and environmental impacts of different future policy scenarios in different rural contexts.

The paper presents an overview of the objectives and structures of the project, including a comparison of the case study areas and an overview of the POMMARD

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model. As the provision of tasks going beyond agriculture is particularly expressed in contexts of less-favoured and mountainous areas, a comparative analysis of territorial impacts of multifunctional agriculture in two mountain regions will be presented here: the Pinzgau-Pongau region (Austria), and the Gorenjska region (Slovenia). A set of policy and market scenarios (five policy scenarios) that were tested across all the study areas are summarized for these two regions by analysing the model results and focusing on major conclusions of the project.

Introduction

Most researches until now used a narrow definition of multifunctionality. The focus is mainly on the simultaneous production of private and public goods, produced alongside the act of farming. Because of this 'joint' production characteristic for many aspects, the research interest has concentrated mainly on 'environmental goods' such as pleasant landscapes and other environmental features.

However, with the increasing priority orientated towards more integrated policy concepts, such as rural development policy, there is a growing need to broaden also the concept of multifunctionality to wider territorial contexts. The discourse on multifunctional agriculture (within the so called 'New Rural Paradigm' as labelled by OECD) explores the ways in which both the market and non-market 'functions', particularly public goods, of agriculture and farm households link with the economic development and quality of life in different geographical territories. Different levels (EU, national, regional, local) of policy interest are concerned with the impacts of agricultural non-market 'functions' on the development of rural localities and regions and in particular on rural development and the quality of life. Little is known about the relationship between these public goods/bads and territorial rural development in different European contexts.

The EU-funded research project TOP-MARD has attempted to explore and extend the multifunctional concept into some new, up to now undefined areas (territorial development, quality of life, labour markets, demography). Empirically, the approach undertaken in modelling territorial impacts of agriculture on rural territory took into account some 'standard' relationships (regional economy, environmental indicators), alongside with some new ones (quality of life, labour market and demographical indicators). A system modelling approach has been undertaken, making use of the Stella® software, which allows exploration of the dynamics of complex systems. The various components shaping the development of rural areas all affect each other and cannot be understood in isolation. The so called POMMARD (Policy Model of Multifunctional Agriculture and Rural Development) has been designed as a tool for understanding multifunctional role of agriculture with its effects on selected geographical areas, i.e. selected regions (mainly on NUTS3 level).

Different policy scenarios were applied to the model. Unlike many models of economic relationships the POMMARD tempts to explore the dynamic relationships between agricultural multifunctionality, territorial rural development and quality of life, and the impacts of different kinds of policies on these relationships.

The paper presents an overview of the main issues and structure of the project, a comparison of the case study areas and an overview of the POMMARD model elaboration and results. A comparative analysis of territorial impacts of multifunctional agriculture in two mountain regions will be shown: the Pinzgau-Pongau region (Austria), and the Gorenjska region (Slovenia). It seems particularly interesting to explore the different relationships against the background of integration of new Member States. While the two regions exhibit similar topographical characteristics (both are typical Alpine regions) there are differences in practice of mountain farming relationship due to the regional economy and divergent approaches in policy implementation. They developed in different institutional settings, which have resulted in profound differences in the level of economic development, structural characteristics, and in the structure of economic activities. Similar policy and market scenario will be tested on these two regions (eg. reduction of single farm payments, shift of CAP funds between axes of pillar 2, increase of cohesion expenditure, and increase of tourism). The results are reported and commented for the two study areas and some important conclusions are drawn from the project results.

The EU research project TOP-MARD

The main aim of the EU FP6 research project TOP-MARD was to develop the concept of multifunctionality as a rural development policy instrument that is sensitive to economic, social, cultural, environmental and geographical context. It was designed so as to analyze how the various functions of the agricultural sector in any given territory affect the sustainable economic development and the quality of life of that territory, and how different policies affect these relationships. One of the main objectives and outputs of the research was to produce a model, called POMMARD, which would allow the simulation of the dynamic economic, social and environmental impacts of different future developments which were made visible through several policy scenarios in different rural contexts.

A central hypothesis underlying the construction of the model is that both market and non-market functions of agriculture can, and often do, act as 'inputs' into the production of non-agricultural goods and services in local economies. Some of these functions are seen as a relevant input into the quality of life of residents. However, these production relationships differ according to a rather wide range of institutional and other factors that vary between places as well as policies. The relationships are also potentially highly dynamic with numerous feedback loops.

Comparison of the case study areas

In TOP-MARD a wide range of countries each with a 'study-area' was chosen to explore the diversity of multiple functions, co-production, and impacts on rural development across Europe. In this way it was possible to examine key features of the problematic across a variety of both natural environments and institutional arrangements. The empirical work was undertaken in eleven study areas. Each of the study areas was selected because of specificities addressing the characteristic set of farm management types within the national and /or the European context of agricultural structures. The result was a sample of study areas that were different from one another, including differences within the areas from community to community and from valley to valley. There were differences in farm structure, in income, in topography, in climate, in type of farming, in farm production. There were also differences with regard to the composition of economic sectors, in the importance of tourism, in population density, structure and growth, in ruralurban dynamics, in migration, and in rural quality of life in general. Finally, and what seems important for regional development aspects, the governance structures and policy regimes also varied considerably within the sample of regions. Nevertheless, the study areas faced many similar problems and challenges, and there were many similarities in the range of public goods associated with agriculture. Although only a minor part of the study areas' economic performance is derived from agriculture, farming was still considered to be an important aspect of these rural regions, with a large influence on people's welfare, as well on other businesses, especially tourism. The study areas basically were NUTS 3 areas (county) or selected at an equivalent scale (with the main exceptions in the countries Spain, Ireland and Scotland).

The study areas were spread over a large part of Europe, from Västerbotten in Sweden on the border with the Arctic Circle in the north, to Latina (Italy), Berguedà (in Spain) and Trikala (in Greece) in the south, and from Mayo in the far west of Ireland, to Bàcs-Kiskun (in Hungary) and Trikala (in Greece) in the east.

The total population living in these eleven study areas in total exceeded 2.5 million people. The greatest number of people lived in the Hungarian study area (more than half million), while the smallest numbers of population were found in the Spanish and Scottish study areas (both having a population of around 38 thousand inhabitants). Västerbotten in Sweden is the most sparsely populated with a population density of 4.6 inhabitants per km², and the German study area on the other extreme is the most densely populated with 271 inhabitants per km².

Table 1. Demography and surface characteristics of study areas

Country	Study area	NUTS 3 Code *	population 2002	Population density (inhab./km²)	Portion mountain area
Austria	Pinzgau-Pongau	AT322	162.300	37,2	1,00
Germany	Wetteraukreis	DE71E	298.120	271,0	****
Greece	Trikala	GR144	132.600	39,0	0,86
Hungary	Bàcs-Kiskun	HU331	541.000	64,1	****
Ireland	Mayo	IE013*	117.446	21,0	****
Italy	Latina	ITE44	519.850**	219,7	0,49
Norway	Hordaland	NO051	448.343**	33,0**	1,00
Scotland (UK)	Caithness and Sutherland	UKM41*	88.600	6,9	0,54
Slovenia	Gorenjska	SI009	197.100	92,4	1,00
Spain	Berguedà	ES511*	39.224***	33,1	0,81
Sweden	Västerbotten	SE081	255.200	4,6	0,90

*= Study area within the NUTS 3 code. For Spain Berguedà lies within ES511, Barcelona province; **=2005 numbers; ***2004 numbers ; **** no numbers, but relatively mountainous in Ireland, mainly flatland in Hungary and Germany
Source: UHI Millenium Institute 2008, p. 50

The unemployment rate for all the study areas was on average 5 percent in 2001. The proportion of unemployed was the lowest in Norway (2.5 percent) and Austria (3.4 percent). The unemployment rate among primary graduates was more than twice the average in Slovenia (15 percent), while it was the lowest in Norway (2.9 percent) and Italy (3.2 percent). Those with secondary education were in the worst situation in the Greek study area, as 14 percent of them could not find a job. The lowest unemployment rate in this educational group was reported by Norway (2.8 percent) and Austria (3.2 percent). The highest unemployment rate in the tertiary educational group was 11.9 percent in Greece.

The functions of agriculture were quite similar in character between all study areas, nevertheless there were clear signs for the influence of regional aspects. In particular, there was a divergent appreciation of the (local) population's concerns and problems, related to the presence of farms and farming. The understanding of these issues differs largely between (and within) the sample of study areas. The 'non-commodities' emphasised in the analysis of the study areas to be important for the quality of the area and for people's valuation of quality of life differ also to some extent between the study areas.

In comparison to other industries, agriculture is a very land-intensive activity. It is therefore unique in the way how it shapes the cultural landscapes in which people reside and organise their livelihoods. Many of the local traditions and cultural activities originate from farm practices. Even if many people have a distant relationship to farming itself nowadays, everybody living in the area or

visiting the area from outside is clearly affected by and experiences the cultural landscape as an outcome that is produced by farm management and shaped by types of farming activity.

Tourism activities, both mainstream and niche market profiles, indeed make a substantial contribution to economic development in many of the regions, and particularly in the case of mountain regions, with Pinzgau–Pongau being the most prominent example within the Alpine area in this respect.

As a consequence of the differences in physical, social and historical conditions, both the styles and the scales of agriculture vary and differ among the study areas. In the Hungarian area for instance, almost half of the cultivated area is occupied by large corporate (formerly cooperative) farms. The average size of these corporate farms is 500 ha, whilst the average farm size in the Greek study area is down to 3.9 ha. Also the main agricultural production sectors vary considerably across the study areas from more livestock focus, like in sheep, beef, meat and milk production, to oil, a significant role for permanent cultures and wheat and other crop products.

European analysis of survey results

In order to produce region specific information on the relevant farm management groups within the study areas the database on contextual features had to be improved. One of the main project tools to find this information was a series of surveys of actors in the study areas. In particular, a survey on farm households and entrepreneurs aimed at assessing the local perspectives towards the provision of public goods by agriculture and the valuation of agricultural performance in this regard. As this is a highly localised contextual issue interviewees provided specific examples of these activities in the interviews. The project also included other surveys with population groups particularly affected by in- and out-migration considerations, like younger population groups. These were thought to be able to address the aspect of quality of life and its implication on migration issues to a large extent. To control their assessment against other parts of the local population an old age person group was also interviewed to find out specific differences in the valuation of quality of life aspects and changes of the assessment in the course of lifetime or due to different attitudes. The Quality of Life survey of rural residents, focusing on young people, the elderly, and women with children was undertaken to explore the importance of different elements of quality of life (using the 'capitals' approach), the role of agriculture in terms of these elements, and their relationship to decisions to leave, enter or remain in the study area as a resident (i.e. migration decisions).

Data for the Quality of Life survey was gathered using a carefully designed questionnaire, usually applied in focus groups to allow careful explanation and discussion of the surveys intention and content. The overall quality of life was rated 4.1 on a scale of five. Irish respondents rated their quality of life the

best while Hungarians evaluated it the worst. In the open countryside people gave a higher ranking to their quality of life (4.3) than people living in "larger towns" (mainly this term would mean actually in smaller towns; 3.9). The differences for other aspects were not as clearly expressed, indicating an overall high valuation of quality of life aspects, with some relevance of lifecycle changes and personal backgrounds.

Table 2. Integrated level of satisfaction with living standards by study areas (using the five-point Likert scale, with 0=low and 5=high)

Country	Mean
Austria	4.4
Germany	4.1
Greece	3.4
Hungary	3.3
Ireland	4.7
Italy	3.7
Norway	4.4
Scotland (UK)	4.2
Slovenia	3.8
Spain	3.9
Sweden	4.2
Total	4.1

Source: UHI Millenium Institute 2008, p. 71

Moreover, linkage to governance aspects was achieved through a National User Group (NUG) that was set up in each of the study areas. The particular aim here was to discuss the main considerations on the concept of multifunctionality with local representatives and the relevance for these local actors within their context. In the end, all the information served as a prime base for estimations of indicators that were required as model input. The need was to address the region specific value of these items so that the regional experience and evaluation adequately influences the model indicators.

Case study area Pinzgau-Pongau

The case study area Pinzgau-Pongau (administrative district NUTS 3: AT 322) has been selected to represent the most widespread farm management types and regional contexts of Austria characteristic for the situation in mountain areas. It is part of the Austrian province (Land) Salzburg which is to a large part characterised by the location in the Central Alps of Austria. All the municipalities of the study area are classified as mountain area, according to article 18 of Council regulation (EC) No. 1257/1999. It is marked by a diversified mountain landscape with the characteristic mixture of high shares of forests, grassland, alpine pastures and rocks. The area of permanent settlement is very limited (only 14.2 per cent of the total area), which results in a rather high

density of 259 inhabitants per km2 permanent settlement area (slightly above the Austrian average). The region is one of the most intensive tourist regions of Austria (and the whole Alps). The area as a holiday location with intensive winter (skiing) and summer tourism (mountain walking trails etc) is therefore under a significant tourist pressure.

Almost all farms in the area are classified as mountain farms and the proportion of organic farms (44 per cent) is the highest for all regions of Austria. The study area is characterized by small scale farming and a very high portion of pluriactivity of farm households. The predominant farming systems are milk production and livestock grazing. The alpine pasture areas account for 71.4 per cent of the agricultural land in the case study area. The forest area covers 37% of the total farm area (Bergmann et al. 2007, p.23).

The management of these extremely sensitive eco-systems by farms (mountain farms) therefore is of great importance in the multifunctional context. This importance is not only relevant for tourism development, but also significant from the point of view of society as a whole, maintaining biodiversity, protection against natural hazards, issues of nature protection and general environmental performance being the main aspects of social demand (Dax and Hovorka 2004). In the study area the Alpine national park "Hohe Tauern" plays a core role for the protection of the environment in these highly sensible mountain areas, with an exemplary role for other regions of Austria as well.

Case study area Gorenjska

Gorenjska is an area with extreme natural and cultural diversity. The alpine area presents 70% of Gorenjska and 40.2% of the region lies at least 1000 meters above sea level. The forest area covers 70% of the total territory. Economy of Gorenjska is characterised by an above-average representation of industrial sector (43.5% of regional value added).

With regard to the natural and geographical characteristics (high percentage of mountain area), the predominating farming type in the region is grazing livestock (especially cattle breeding). It involves more than half (62%) of all farmers in the whole structure. The second considerably important farming type is mixed livestock production. Less than 10% of farming is recognised as mixed crop and livestock production.

In this study area the major part of the agricultural areas belongs to farmers as their own agricultural land. Within the farms' structure family farms are predominating. Most of the agricultural commodities are conventionally produced and local market targeted. Agricultural cooperatives are quite well spread through the region. They take care for collecting and buying agricultural commodities (especially milk, beef, crop and potatoes), wood and other

farm products. Bigger processing plants are relating to slaughterhouses, while the small one are most of all located on the farms or are in private hands (Gorenjska Regional Development Programme 2007-2013).

In the northwestern part of Gorenjska region the only national park of Slovenia, Triglav National Park (TNP), is situated. This national park is especially interesting due to the diversity of its landscape and preserved natural mountainous features which are also important for tourism development as a main economic activity in the area.

Comparison of the study areas Pinzgau-Pongau and Gorenjska

The areas in Slovenia and Austria are located on the southern and northern side of the Alps respectively, experiencing a high altitude inland climate. Tourism and farm tourism have both become an important business in the two study areas.

In Table 3 some key social and economic indicators of the two regions are compared. Both areas are mountainous and have a lower population density than the national average, but in Pinzgau-Pongau the population density (37.2/ km2) is much below that of Gorenjska (92.2/km2). With relation to agricultural structures, the number of farm units is very similar, being slightly above 4,000 in the last agricultural census. Net farm income as well is at the same level, despite the different history of agricultural policy over decades in the second half of 20th century. This underscores the production difficulties of mountain farms which largely limit the production potential and farm income chances in these areas. On the other hand, one can see the comparably higher share of farmed and forested land in the Austrian study area.

In contrast to these similarities regional economy is more advanced in Pinzgau-Pongau. The GVA per capita is in the Austrian study area more than double of that in the Slovenian study area. Any kind of regional policy aid is thus very relevant to Gorenjska region (see Gorenjska Regional Development Programme 2007 – 2013), but of less influence for Austrian study areas, like Pinzgau-Pongau.

Table 3. Key socio-economic data in study areas Pinzgau-Pongau and Gorenjska (2001)

		Pinzgau-Pongau	**Gorenjska**
Number of farms	number	4,370	4,680*
Net farm income	€1,000	8.48	10.91*
Average ESU per farm	ESU	7.15	5.01*
Labour demand agric.	head	4,510	5,420*
Farmed and Forested land	hectar	176,410	32,460
surface	hectar	435,500	212,400*
Population size	head	161,996	195,885
Under 20	head	42,361	45,457
Over 65	head	20,939	27,938
population density in km²	km²	37.2	92.2*
GVA per capita	€/head	22.2	9.9
GVA land use	1,000 €	105,107	42,337
Regional employment	head	73,484	92,458

* data for 2003
Source: Bergmann et.al 2008

In both areas the main functions of agriculture, beside the production of food and fibre, are to maintain the high quality of environment and to ensure the social viability of rural areas. Both areas have agricultural and rural development support schemes including programs directed towards the protection of natural habitats and more environmental-friendly production such as special support schemes to increase organic farming.

In Austria, the maintenance of natural and cultural rural landscapes is supported unanimously by the stakeholders and policy makers. The most important Rural Development Programme (RDP) measures in the study area are the Less-Favoured Area (LFA) compensatory allowance (LFA and areas with environmental restrictions) and the agri-environmental measures in ÖPUL (agri-environmental measures), both together building the main measures of RDP and subsumed in axis 2 of RDP 2007-2013. This is, of course, due to the high proportion of mountain farms, alpine pastures and organic farms in the area which address the aims of the measures to a very high extent. Another important feature of the Austrian rural development policy is the long lasting priority and experience for programmes and measures of a Leader-like type (OECD 1998). This approach has been started even before EU accession in 1995 and therefore Austria disposed of a high administrative knowledge and regional and local interest to engage in these activities from the beginning of Leader support. As for large parts of Austria, the study area comprises significant activities of LEADER+ groups (in the past programme period, but also up new Local Action Groups for the current period have already been set up). 47 of all the 53 municipalities in the study area were members of the three active LEADER + Groups in the period 2000-2006.

In Slovenia, the problems related to post-war agricultural policies were different from the other countries in the study, and, until at least the pre-accession period, have been dealt with by other types of initiative and technologies. The transition into a new economic system and new governing bodies has faced farming and the agriculture industry with huge challenges. The national policy in the new member states has to work towards compliance with the EU system (Hočevar et. al. 2007).

After the transition and EU-membership, Slovenia lists the following rural development measures: LFA support; agri-environmental measures; food quality schemes; support for economic diversification of agricultural households. In addition, the rural areas take part in several cohesion policy measures.

The POMMARD policy model

The TOP-MARD policy model POMMARD (Policy Model of Multifunctional Agriculture and Rural Development) is a dynamic simulation model, programmed in STELLA™. It links EU, National and regional policies, governance, resources, and regional activities to social, economic and environmental outcomes in each region. A single core model has been built from which the 11 adapted regional models were derived. This allows regional differences to be incorporated into the models, yet ensures that the results of policy simulations from the 11 regions are comparable (Bryden et al. 2008, p.31).

POMMARD is largely supply oriented (with demand constraints). The model contains 10 modules: Initial Conditions, Policy Controls, Indicators, Land, Non- Commodities, Agriculture, Quality of Life, Human Resources, Region, and Tourism. In Figure 1 below the general relationships between the different components of the model are shown.

Land use is the primary economic driver in this model. Land use determines agricultural production of commodities and non-commodities. It also determines the amount of labour employed in agriculture. The regional economy is, in turn, driven by the supply-oriented agriculture module (and other special modules) and demand drivers from the larger (state or global) economy. The initial conditions and policy controls provide inputs to the model for scenario analysis. Finally, indicators allow the user to monitor changes in key variables.
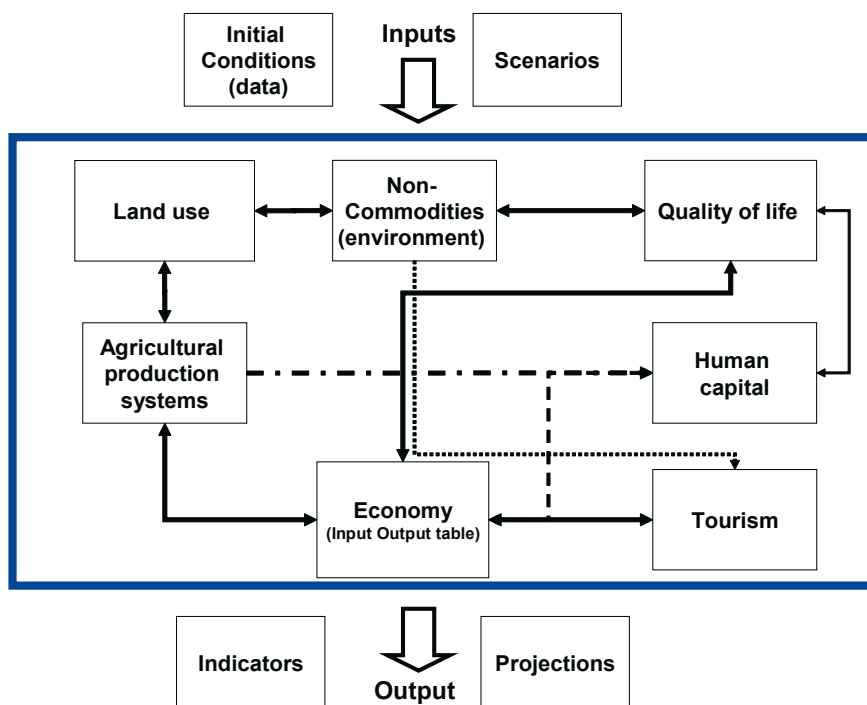
Figure 1. Overall Structure of the POMMARD
Source: Bergmann and Thomson 2008; Bergman et al. 2008

The Agriculture Module (Agricultural production system)

Agriculture is assumed to be supply-oriented and is organized into alternative production systems. Farmers make decisions about the production systems they will adopt based on policy and other exogenous information. The choice of production systems determines land use. Agricultural production, determined by the amount of land allocated to each production system and the agriculture output coefficients, adds to the agriculture output inventories. Agriculture production is linked to the Region Module by agriculture labour demand, purchase of locally produced inputs and agricultural income which induces some consumption demand. Policy changes are introduced through exogenous changes in the prices of agricultural commodities and in policy subsidies and payments. Changes in prices of agricultural commodities are introduced through a commodity price change vector. Net farm income is calculated from changes in production systems, changes in commodity prices and commodity, production system and land subsidies.

The important innovative element of the model is its structure implying a comprehensive assessment of the different relationships and sectoral contributions to tasks and services provided by agricultural within the regional context. The modules of Quality of Life, Human Capital and Tourism are

therefore direct indicators for this approach. In this structure, these are influenced by farm management decisions and different farming types so that the impact on the regional economy and the non-commodities can reflect these elements as well.

POMMARD was designed for policy analysis. The first step in analysing policy is to generate a baseline projection for the regional economy. Alternative scenarios are then developed by introducing changes in the policy controls converters, or more commonly, by discrete changes in the exogenous drivers of the model. A wide variety of exogenous variables, especially policy intervention variables, have been built into the model, including final demand growth rates, changes in land use, mix of production systems, agricultural prices, subsidies, exogenous expenditures and income and transfer income.

Model results for the case study areas

The selection of a series of scenarios should present a first impression on the potential use of the model for dealing with policy change issues. Each of these scenarios form the basis for separate POMMARD simulations (projections into the future, in our applications to the year 2025), and comprise:
1. two "Base Scenarios", one using data for 2001 (or a nearby) initial data year, and the other defined to include changes to date (2007) and to be used as a comparator scenario
2. eight "Alternative Scenarios", each representing a reasonably conceivable change in policy conditions after 2007. The eight Alternative Scenarios were specified as below at EU level; teams were required to apply these scenarios as appropriate to their country and case study area.

In this paper the results of the main baseline in the year 2025 are compared with the results of the following four scenarios[3] for results in the year 2025:

A1. Direct (Single) Farm Payments Cut by 50%: a 50% cut in annual direct payments (DPs) to farmers (both rates and totals) starting in 2007, with no reallocation of funds e.g. to Pillar 2 or Structural Funds (and no change in farm commodity prices: see below).
B. All Axis 2: in this Alternative Scenario, spending on rural development (i.e. Pillar 2, in EU) in 2007-13 (and beyond) in the study area remained as in the EU budget but all Pillar 2 spending was reallocated to Axis 2, i.e. to agri-environmental land management (and none to Axis 1 farm development, nor to Axis 3 rural infrastructure and diversification). Pillar 1 spending stayed the same.

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3 The main scenarios caried out and documented in the final report focus on an increase of regional funding (scenario D: 50% more regional funding in the study area), and a 100% increase in energy prices (scenario E: doubled energy prices) which are either less relevant in the study areas or reveal less region specific features, and therefore are not reported here in more detail (see UHI Millenium Institute 2008, 96 et seqq.)

C. All Axis 3: in this Alternative Scenario, rural development (i.e. Pillar 2, in EU) spending 2007-13 in the study area remained as in the EU budget but all Pillar 2 spending is reallocated to Axis 3, i.e. to rural infrastructure and diversification (and none to Axis 1 farm development, nor to Axis 2 agri-environmental land management). Pillar 1 spending stays the same.

F. Intensification of Tourism: this Alternative Scenario involved a gradual increase in tourism demand (i.e. tourist expenditures) from its 2006 (or the latest available year) level(s) to reach a 100% increase by 2013, and thereafter constant. Teams decided on the timing, seasonality and tourism type (e.g. day trippers and hikers, or "long stay" tourists/hunters/ anglers), and implemented these via the appropriate converters in POMMARD.

The output and outcome indicators of the model show the economic, social, demographic and environmental consequences of the various scenarios for the range of rural regions represented by our study areas. The reference years for analysing the model results in this paper are 2007 and 2025.

As the study areas differ in physical, socio-economic and institutional and governance conditions, the parameters of the adapted POMMARD models necessarily vary. The outcome indicators will therefore be influenced not only by the model input data but also according to differences in the relevant parameters. In addition, these indicators will also be influenced by the existing (baseline) importance of each policy element examined (Pillar 1, Pillar 2, the three axes etc.), which also varies between study areas. Pinzgau-Pongau and Gorenjska belong to areas with relatively low gross value of agriculture in relation to land area.

Table 4. Scenario results for Pinzgau-Pongau in 2025 in percent

	Main Baseline	**Main Baseline**	**Scenario A**	**Scenario B**	**Scenario C**	**Scenario F**
	(2025/2007) x100	**2025**	**2025**	**2025**	**2025**	**2025**
Total Population	119.7	100	103.5	99.7	113.0	120.0
Per Capita Income	98.5	100	100.3	100.1	101.0	100.9
Non-ag employment	116.5	100	103.9	99.6	114.5	122.2
Total Migration	103.0	100	120.6	97.3	173.9	136.9
UAA	98.5	100	98.0	100.3	93.9	99.1
GVA (Gross Value of Agriculture)	98.4	100	97.8	100.3	93.5	99.1
Ag Employment	99.7	100	99.4	101.1	98.3	99.6
Excess Nitrogen	96.5	100	96.2	100.0	90.5	98.7
Biodiversity	100.0	100	99.9	100.0	99.8	99.9

Source: own calculation with POMMARD

Table 5. Scenario results for Gorenjska in 2025 in percent

	Main Base-line	Main Baseline	Scenario A	Scenario B	Scenario C	Scenario F
	(2025/2007) x100	2025	2025	2025	2025	2025
Total Population	95,4	100,0	100,5	101,7	100,7	99.5
Per Capita Income	102,3	100,0	99,7	100,5	99,9	99.9
Non-ag employment	100,3	100,0	100,6	102,1	100,8	99.4
Total Migration	122,5	100,0	100,4	112,8	103,7	96.5
UAA	101,5	100,0	99,7	100,3	100,0	98.4
GVA (Gross Value of Agriculture)	112,2	100,0	99,7	100,2	100,0	96.9
Ag Employment	101,0	100,0	99,7	100,3	100,0	99.5
Excess Nitrogen	101,5	100,0	99,7	100,3	100,0	98.1
Biodiversity	100,4	100,0	99,7	100,4	100,0	100.2

Source: own calculation with POMMARD

According to the main baseline results for 2007 with those for 2025, agricultural policy changes have significant positive impacts in both study areas. Comparison of results of different scenario runs for 2025 reveals that in both regions, the total population rises in relation to the main baseline (the only exception being scenario B in Pinzgau-Pongau and Scenario F in Gorenjska). In Pinzgau-Pongau the highest increase in total population and total migration can be expected with scenario C and F, whereas differences in overall population change between the scenarios for Gorenjska is only incremental. Not much change is to be seen for the development of per capita income. In Pinzgau-Pongau results reveal a slight increase, and in Gorenjska a slight decrease of per capita income. With respect to non-agricultural employment, the scenarios tested do not tend to bring significant changes in Gorenjska as the region has a relative low agricultural employment and the scenarios tested affect agriculture the most. It must be mentioned that scenario F cannot be esteemed to be realistic for Pinzgau-Pongau since the high level of intensive tourism already achieved at present can hardly be doubled (without significant drawbacks) in the future, as is the underlying assumption for this scenario.

As for the migration flows, the regions reveal varied results. In the case of Gorenjska, the scenarios tested reveal a general decrease of in-migration. On the opposite, main baseline assumptions would result in a slight migration decrease until 2025. Comparison of different scenarios reveal that potential for annual net migration increases significantly with increased RD Axis 3 expenditure or increased tourist demand (with the same disclaimer as in the case of this scenario for non-agricultural employment).

Total agricultural area and agricultural employment seem to remain relatively unaffected throughout the analysed period. As expected, the indicators would be adversely affected by a switch of RD expenditure to Axes 1 or 3 . Simi-

lar effects are reflected also in the case of gross value-added for agriculture, where the figures for Pinzgau-Pongau are reflecting almost identically the land use changes. Results for Gorenjska suggest deterioration of both, gross value-added in agriculture, which can be a combination of the expected fall of agricultural prices with respect to the (bumper) 2007 level and low competitiveness of agriculture's upstream (i.e. food processing) sector in the region.

The non-commodity (i.e. excess nitrogen and biodiversity) indicator in both cases see its highest change with the continuation of the Main Baseline (with a strong Axis 2 expenditure in both cases), or with Scenario B (increased Axis 2 RD expenditure) suggesting that high(er) public support on environmental and spatial public goods would reinforce the environment as well as profit rural viability.

Overall, the comparison of the results given by the scenario runs reveals that scenario B is a less attractive option for the non-agricultural sector but an attractive option for the agricultural sector. Scenario B is likely to indicate that preservation of farming and the environment in this area also preserves the settlement structure.

Difference in the scenario results between the regions underpins the hypothesis that policy reform impacts for agricultural sector and general socio-economic variables are largely dependent on the structure of actual policy priorities. The divergence in the policy approaches and the financial spending of existing measures has a clear impact on future policy outcomes. On the contrary, the impacts on the non-commodity (public-good) outcomes are more straightforward: higher public expenditure on provision of public goods in agriculture results in greater provision of these.

Conclusions

POMMARD deviates from the 'conventional' modelling approaches in analysing multifunctional agriculture. It has adopted a 'system dynamics' approach, which is a new approach towards modelling of rural policies. This approach has been utilised in order to explore complex and dynamic relationships between various components of rural economies. POMMARD has the ability to model the dynamic impacts of policy changes after 2013, and also to represent very long run developments. Various policies affecting economic, social or environmental welfare of a chosen region are treated as a separate model component and can be adapted.

The results for the two case study areas Pinzgau-Pongau and Gorenjska show that analysing common scenarios by using the features of this policy model leads to results that vary to a significant extent. It can be shown that the impact of policy reform is largely dependent on the starting situation and level of policy application. Moreover, regional indicators, the linkage of agriculture to the regional economy and the valuation of aspects of quality of life

are relevant elements influencing the outcome on the provision of multifunctional services within the regions and have an impact on the effectiveness of policy changes.

Multifunctionality in agriculture is generally considered as the joint production of both a physical commodity such as wheat or beef, and of a non-commodity output (NCO) such as landscape or wildlife. The lack of a market for NCOs (or at least a direct one for most of them; tourism, and to some extent desired inmigration, clearly rely openly on such NCOs) poses a problem for policy makers in deciding whether and how far to modify commodity policy instruments such as production subsidies to take account of NCOs, or whether to design and implement two separate sets of instruments.

The policy implications of the results of the TOP-MARD project – as derived from both its survey and modelling elements – can be drawn at a number of levels, from farms or farm households, through regions and countries, to EU level. Similarly, implications can be analysed in economic, social (e.g. demographics, education), or environmental terms, taking into account the various actual or potential policy instruments available in these areas. It is however fundamental to this analytical approach that future policy should be considered in a more "territorial" (i.e. regional) sense. In some cases, this may suggest more "integration" of existing policy design and implementation, whereas in other cases more fundamental changes in government structures and in governance may be involved.

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