SUSTAINABILITY DIMENSIONS AND INCOME PROSPECTS FOR THE FARMING SYSTEMS IN THE NEW MEMBER STATES

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ABSTRACT

An investigation carried out at the farming system level on the sustainability dimensions and agricultural income prospects in the Czech Republic and Lithuania under the implementation of the 2003 common agricultural policy reform reveals (a) the economic dimension as the leading one in terms of the overall sustainability rank position farming systems achieved, and (b) that under certain policy scenario assumptions, adoption of energy crops (Czech Republic) or conversion to organic farming (Lithuania) trigger potentially the highest farm gross income at the 2013 time horizon.

Keywords: sustainability, dimensions, systems, CAP, NMS, income.

1 INTRODUCTION

The accession at 1 May 2004 to the European Union (EU) of ten new Member States (EU-N10) is a key element at the time of shaping the European model of sustainable agriculture. The agricultural policy agenda reflects sustainability-related concerns building on the Amsterdam Treaty (1997) that first included sustainable development as an EU objective. Since the beginning of the Cardiff process in 1998, subsequent European Councils reaffirmed the commitment to integrate sustainable development concerns into all Community policies and to develop appropriate indicators to monitor such integration. Following the European Council in Vienna (1998), the European Commission included the environmental dimension as an important component of the common agricultural policy (CAP). The European Council in Göteborg (June 2001) endorsed the EU strategy for sustainable development by adding the environmental dimension to the social and economic ones.

On this background, this paper aims to contribute to the understanding of the sustainability dimensions at the farming system level in the EU-N10 context. Several farming systems are identified and described along the economic, social, and environmental dimensions of sustainability, characterised using sustainability indices, and a sustainability ranking is defined. The impact of selected policy instruments introduced under the 2003 CAP reform on the economic dimension of sustainability is then explored at the 2013 time horizon, using the gross farm income as proxy. The underlying assumptions of the approach are that (a) sustainability is a dynamic and site-specific characteristic of farming systems, and that (b) assessment of sustainability can be made in relative terms, via comparisons and ranking of farming systems.

The remaining of the paper is organised as follows. Section two provides the broad background to the appraisal of sustainable agriculture and a brief overview of selected EU-N10 countries. Section three describes the methodology for identification and characterisation of farming systems, their associated dimensions of sustainability, and the policy scenarios developed. Section four reports the farming systems identified, as well as the potential position of their gross farm income in 2013 under the prospective policy setting-ups and alternative managerial options they would induce, while section five concludes.

2 BACKGROUND TO SUSTAINABLE AGRICULTURE APPRAISAL

The concept of sustainability applied to agriculture has emerged in response to increasing concerns about the adverse environmental impact of intensive agriculture (RASUL and THAPA 2003). The definition of sustainable agriculture often depends on the discipline, professional background, or researcher's particular interests (RUTTAN 1994). The aims of sustainable agriculture include (i) food sufficiency, (ii) stewardship of natural resources, (iii) social or community well-being (LOWRANCE et al. 1986; PETERSON and NORMAN 2001), (iv) sustenance of welfare over time, or (v) meeting consumers' concerns. This diversity of views is somehow justified by the fact that agricultural sustainability tends to be site-specific (BYERLEE and MURGAI 2001), and developments at higher levels (i.e. national policies, globalisation trends, or international markets) strongly influence it. Disagreements about agricultural sustainability emerge from (a) different views on what is to be sustained; (b) the length of time during which the characteristic(s) are to be sustained; (c) adequate thresholds against which to evaluate the current sustainability position and/or to account the eventual reach of agricultural sustainability; or (d) methodological issues (CARPENTER 1995; SEN 1992). The debate reaches also detailed technical aspects of production. Some authors (SCHALLER 1993; PRETTY 1995) consider the low use of external inputs as a major requirement for agricultural sustainability; others (HANSEN 1996; WEBSTER 1997) support the use of external inputs within limits so that soil nutrient levels and yields are maintained.

Most definitions of agricultural sustainability seem to converge to an agreement about the multidimensionality of the concept, which encompasses at least three dimensions and associated goals, namely economic efficiency, environmental stability, and intergenerational equity (PANNELL and SCHILIZZI 1999; SANDS and PODMORE 2000). Ideally a holistic appraisal of agricultural sustainability should integrate at least these three dimensions, and sometimes a fourth, institutional dimension, is added. ZHEN and ROUTRAY (2003) note that sustainable agriculture is a time- and space-specific concept and its assessment should be closely linked to the context in which the specific farming system exists.

Farming systems have been defined at the farm level (DILLON and HARDAKER 1993; DE KOEIJER et al. 2002; HELANDER et al. 2004), and seldom at higher aggregation levels such as homogeneous populations (MAZOYER 1988) or regions (FAO 1993). At the farm or community levels, it is possible for actors to weigh up, trade off, and agree on the criteria for assessing sustainability trends. At more aggregated levels (district, regions and countries) it becomes increasingly difficult to trade off in a meaningful way. That is why most of the research on sustainable agriculture was carried out at the farm level (Ministry of Agriculture and Agri-food of Canada 2000; RASUL and THAPA 2003), and fewer references regarding a territorial approach to the assessment of agricultural sustainability dimensions exist. When a regional approach is adopted (DIXON et al. 2001) the studies do not refer to the agricultural activity in particular but to general economic and social developments. This is the case of most methodologies developed by international organisations and institutions.

The multidimensionality of sustainable agriculture concept made its assessment to be more often based on using indicators. The challenge when measuring the sustainability of farming systems is how to construct spatially and temporally acceptable indicators, and how to apply and integrate such indicators for assessing whether a particular practice/system is sustainable or not. Lists of sustainability indicators have been developed by various national and international organisations (e.g. OECD, 2001). CLAVERÍAS (2000) provides a summary of the most significant characteristics such indicators should have; for classifications of indicators, see ZHEN (1994) and BALDARES et al. (1994). Some indicators are summaries of national agricultural censuses or repeated survey data, others are calculated using existing or newly developed mathematical models or formulas and an integration of census data, and sometimes custom data sets. One of the main issues of these approaches is the lack of a systematic approach of elaboration of synthetic global indexes that should allow comparison among countries. Recent attempts were made to develop synthetic indicators which should integrate the different variables of sustainability, enabling their comparability (GONZALEZ LAXE and MARTÍN PALMERO 2004).

3 METHODOLOGY AND DATA

3.1 Farming systems and the associated dimensions of sustainability

The analysis was carried out using the Czech Republic and Lithuania as case studies. The aim was to illustrate, apart from two different regional contexts (Baltic vs. Central Europe), contrasting situations in terms of importance of agriculture and agricultural employment in the national economy, as well as the take-up rate of sustainable farming practices (here, only organic farming rate of adoption was considered given the support its taking-up receives under the CAP).

As the selected unit of analysis is the farming system linked to a certain territory, identification and delimitation of agricultural homogeneous regions was carried out at Local Administrative Unit (LAU1) level, the lowest territorial unit for which detailed statistics relevant for this study were available in both countries. The final outcome (regions and farming systems) was validated by consulting national experts in both countries.[1,2] Next, each territory-linked farming system (hereafter farming system) was identified and characterised using detailed information about agriculture and related social, environmental and economic aspects. Identification, delimitation and description of the farming systems relied on a set of determinants clustered in five general criteria (land use, agro-climatic aptitude, livestock, property and holding size, population characteristics). The rationale for using the selected criteria was to adopt a multidimensional approach of the concept of farming system, and not being limited exclusively to agronomic aspects. To each criterion, a set of determinants was further attached (e.g. variables attached to land use include total area of the system; share of the total national area; arable/grassland/garden land use shares; main crop productions; shares of crop-, livestock, and mixed-orientated farms in total number of farms associated to the given system; share of land under organic crops of total land of the system). Inter-countries comparisons of the farming systems identified are not possible, as the lack of suitable data from LAU1 level made that some of the variables used did not coincide in both countries.

The indicators associated to the economic, social and environmental dimensions were then computed using secondary data associated to the territory each farming system covered. An extensive review of the relevant literature was the base for selecting the indicators and variables that (a) were among those proposed by different official organisations like EC and OECD; (b) reached the three sustainability dimensions; (c) included qualitative and quantitative information, (d) were representative for the different farming systems, and (e)

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[1] Statistical information from such a disaggregated level is often not available outside the region of origin (i.e. EUROSTAT does not currently cover this territorial level), is scattered, of very different nature, and the result of different methodologies. Sometimes, the territorial or time-related coverage does not include either the country in its entirety or a sufficient period of a study. This difficulty appears to be even greater when one tries to access the same information in different countries, although in general, a persistent work of investigation and a wide network of national and regional contacts allow surpassing such difficulties.

[2] The Czech Republic is divided into 8 NUTS2, 14 NUTS3 units, and 77 LAU1 units (districts). In Lithuania, there are 10 NUTS 3 and 60 LAU1 units.

could be obtained from secondary data. They include: livestock density, land erosion, nitrate pollution, share of land under organic farming, and agro-ecosystem biodiversity (for the environmental dimension); density of farmers per agricultural land, share of elderly population, variation of the rate of population, unemployment, and concentration of farming land (for the social dimension); farming structure, yields of main crops; income of farmers, and share of LFA in agricultural land (for the economic one). The remaining steps included computing each variable at the LAU1 level (resulting in a unique value for each farming system); standardisation of each unique variable (to allow comparison and grouping into indicators); computing their arithmetic averages for each sustainability dimension, and normalisation of the standardised variables allowing a subsequent ranking. The standardised values were obtained as $Z_{si} = \frac{X_i - \overline{X}}{\sigma x}$, for those variables considered having a direct link with sustainability, and $Z_{si} = \frac{\overline{X} - X_i}{\sigma x}$, for those with an inverse link, where Z_{si} = value of the standardise variable at farming system level, $\overline{X}$ = mean of the distribution at farming system level, Xi = value of a variable at farming system level, and σx =standard deviation of the distribution at farming system level. For those indicators containing more than one variable, the standardised value was computed as arithmetic mean. Normalisation made that the value obtained for each sustainability dimension become a normal standard percentile taking values from nil (lowest rank position) and 100 (highest rank position). Values obtained this way are not absolute sustainability values, but serve to set a sustainability ranking of the farming systems in each of the three dimensions. Finally, a global Farming System Sustainability Index (FSSI) was obtained as the arithmetic mean of the percentiles calculated for each sustainability dimension. This global index was used to establish the overall sustainability ranking of the farming systems. It is not an absolute sustainability value but indicates the position of a given farming system reached for the specific sustainability dimension in relation to the other systems.

The policy scenarios exercise first defined a standard (non-organic) farm and then evaluated what its agricultural income would be in 2013 under three policy settings (see below) and three alternative managerial options, i.e. if the farm continued being (a) non-organic farm (i.e. no change), (b) converted to organic farming (i.e. total change), or (c) introduced energy crops in the crops rotation (‘energy crops’ farm) (i.e. partial change).

Standard farms (one per farming system) were constructed using the average values of 2001-2003 FADN samples. For defining the organic farm (i.e. a non-organic farm that by 2013 became an organic one), the differences in costs, productivity, and prices with regard to *non-organic farms* were based on information from relevant literature and own field survey in the two countries carried out in 2005. It should be underlined that for 2013 the full amount of organic payment was considered plus a 10 % increase (except for No Accession scenario). For the energy crops farm, the working hypothesis was a change in the cropping structure by 2013, i.e. 100% of the set-aside land in 2001-2003 and 50% of the FADN category “other field crops” (potatoes, sugar beet etc.) area would be cultivated with rape, making the farm eligible for ‘energy crops’ payments. The approach was based on remarks (HABART (2005) for the Czech Republic and VRUBLIAUSKAS (2000) for Lithuania) that about 15 % of utilised agricultural land is set-aside (i.e. farmers receive subsidies for energy crops for the 50 % of above-mentioned area; this assumption was applied on for the Czech farms as Lithuania did not provide subsidies for energy crops during pre-Accession). The impact of managerial decisions was then evaluated under the three policy scenarios developed at the 2013 time horizon without looking at the intermediate years. “Business as usual” (baseline) scenario reflected the post-Accession situation in the two countries (i.e. implementation of the CAP and its most probable trend it will follow until 2013). The other two scenarios simulated a non-EU accession situation (“No-Accession” scenario), and a hypothetical effort of the CAP to accelerate the adoption of more environmentally friendly and sustainable farming practices (“Environmental CAP” scenario).

For the policy support under the Baseline scenario, as the time horizon of simulations is 2013, calculations were made with 100 % value of Single Farm Payment (SFP) in both countries. Since little was known at the time of this study about the future implementation of the SFP, and to simplify the simulations, the future SFP was considered to be similar to Single Area Payment Scheme (SAPS) applied in these countries, based on the remark that from 2009 all EU-N10 (except Malta and Slovenia) are to adopt a regionalised SFP system (European Commission 2005) under which payments are rather similar to those under SAPS. For the organic farm option, the SFP amount per hectare was set for the year 2013, the amount varying according to the production profile of the farming system. For energy crops, a specific CAP aid per hectare was also set as foreseen in CAP and national documents, assuming that in 2013 the amounts of both payments would reach the level of current EU-15 aid. In the “no-Accession” scenario, the pre-accession agricultural policy applied in Czech Republic and Lithuania (even before EU-15 co-financing) was supposed to continue until 2013. For the ‘non-organic farm’ option, the assumption was that in 2013 exclusively pre-accession national subsidies (computed as 2001-2003 FADN averages) will be available. For the ‘organic farm’ option, the payments per hectare were fixed at the level existing before EU co-financing (years 2001-2003), amount that was added to the national payments. For the ‘energy crops farm’ option, the payments of the pre-accession period (only available in the Czech Republic during pre-accession) were supposed to continue in 2013. The “Environmental CAP” scenario developed on the structure of Baseline scenario, the main differences resting on the assumptions related to the future of the policy instruments considered. Higher rates of payments for the organic farm and ‘energy crops’ farm were assumed to be made available, the higher payments resulting from reductions of the SFP amount so that the agricultural budget would not be overshot (i.e. a 10 % increase of organic or energy crops subsidies came with a 1 % cut of the SFP).

The scenarios exercise focused only on the economic dimension, owing to the lack of time and resources of this study. The main quantitative variable reported here is the *gross farm income* (GFI). In all simulations, yields, prices, costs and taxes for the year 2013 were adjusted for inflation using information from OECD/FAO (2005), and EC (2005) projections (i.e. the accumulated inflation for the period 2004-2013 applied was 20.71). Increases of crop and livestock yields until 2013 were assumed the same for organic, non-organic, and energy crops farms, despite differences in yields between organic and non-organic farms (mainly obtained from own field survey carried out in 2005). World market price projections for 2013 were used with some adjustments (e.g. where available, producer instead of retail prices were used). Percentage differences of prices of organic and non-organic produce were estimated using different sources, including both primary information (2005 field survey) and secondary sources. In all alternative options, taxes were adjusted by the accumulated inflation to 2013. No variations of production costs in real terms (apart from inflation) were considered given the tediousness of such endeavour for the farming systems as defined here. Differences in terms of costs between organic and non-organic farms, mainly obtained via own 2005 field survey in the two countries, were applied for the “organic farm” option. Subsidies were not assumed to increase with inflation.

4 RESULTS

4.1 Sustainability dimensions of the farming systems identified

Homogeneous regions were first identified at LAU1 level and attached to them five farming systems in the Czech Republic and six in Lithuania were defined. Table 1 reports the result of evaluating the sustainability dimensions at the farming system level.

Table 1 Sustainability dimensions at the farming system level

Country	Farming System	Dimension: environmental	social	economic	FSSI
Czech Republic	Crops-Oriented Sugar Beet (COSB)	49.82	93.72	100.00	81.18
	Crops-Oriented Maize (COM)	0.00	56.72	58.93	38.55
	Mixed-Oriented Grassland (MOG)	91.26	58.96	43.26	64.49
	Livestock-Oriented (LO)	93.99	50.26	54.41	66.22
	Mixed-Oriented Potatoes (MOP)	92.35	58.99	70.82	74.05
Lithuania	Livestock-Oriented (LO)	51.52	48.73	76.98	59.08
	Crops-Oriented (CO)	36.51	29.82	82.97	49.77
	Crops-Marginal (CM)	49.92	4.60	0.00	18.17
	Livestock-Marginal (LM)	61.36	76.10	47.61	61.69
	Urban-Oriented (UO)	44.55	100.00	53.78	66.11
	Intermediate System (IS)	64.51	49.13	47.03	53.56

Note: FSSI (Farm Synthetic Sustainability Index). Each index is associated to a sustainability ranking scale that takes value from nil (lowest) to 100 (highest).

Among the Czech farming systems, COSB reports maximum values for the social (93.72) and economic (100) dimensions. The negative value of population age structure indicator influences the result of the social dimension. The high value for the economic dimension is the result of a positive value for all but one associated indicators, the highest values being related to those of the holdings structure (low land share in holdings of less than 10 ha, and low LFAs share). The peculiarity of COM system is associated with the nil value reported for its environmental dimension, justified by the highly negative values of almost all associated indicators (particularly those related to land erosion, low livestock density, and crop diversity). Based on FSSI value, the Czech systems rank from Crops-Oriented Sugar-beet system (the highest) to Crops-Oriented Maize system (the lowest). In Lithuania, CO system ranks the last among all systems when its environmental dimension is considered, a high nitrate pollution being the main reason for this outcome. For the social dimension, negative values are reported for the farming land concentration index and population density. The high value for the economic dimension is the result of a good holdings structure and a low LFAs share. The low value of the environmental dimension for the CM system is the result of low livestock density (0.16 LU/ha agricultural land) and high land erosion, somehow balanced by its a high percentage of organic farming area (2.66 %). In the overall ranking based on the FSSI value, Urban-Oriented system ranks the first and Crops-Marginal system the last.

Table 2 reports the main characteristics of standard Czech farms (CZ1 to CZ5) associated to each farming system, as well as their initial GFI position (2001-2003 average). The table reads as follow. The standard farm of Livestock-Oriented system, covers about 850 ha of UAA; the percentage area under cereals and forage crops is balanced (40.04 % and 40.31 % respectively), while the livestock density is 56.88 LU/100 ha (mainly dairy cows). Its gross farm income is 352.33 EURO/ha. This CZ4 farm is the representative farm for the Livestock-Oriented system, and is used in the policy scenarios.

Table 2 Agricultural and economic variables for the Czech standard farms used in the simulations

Variables *FADN code*	**CZ1** **Crops-Oriented Sugar Beet System**	**CZ2** **Crops-Oriented Maize System**	**CZ3** **Mixed-Oriented Grassland System**	**CZ4** **Livestock-Oriented System**	**CZ5** **Mixed-Oriented Potatoes System**
Sample farms (*SYS03)*	*659*	*45*	*168*	*215*	*238*
Economic size (ESU)* (*SE005)*	292.28	553.38	156.22	344.10	269.28
Utilised agricultural area (ha) (*SE025)*	626.07	1,030.18	611.10	849.83	758.60
Total livestock units (LU/100ha) (*SE080)*	56.08	100.49	45.64	56.88	53.30
Gross Farm Income (*SE410)*	355.21	332.24	239.56	352.33	258.45

Notes: The table reports average FADN values in 2001-2003 years. GFI=Total value output-Intermediate Consumption+ Subsidies.
* ESU = European Size Unit.

Source: own calculations based on the Czech FADN LA data.

Similarly, Table 3 reports the main characteristics of the standard farms associated to the Lithuanian farming systems. As for the Czech Republic, one standard farm per farming system is selected in Lithuania in order to carry out the simulations. These representative farms (named from LT1 to LT6) are also obtained through FADN data averages 2001-2003.

Table 3 Agricultural and economic variables for the Lithuanian standard farms used in the simulations

Agricultural variables ***FADN code***	**LT1** **Livestock -Oriented System**	**LT2** **Crops-Oriented System**	**LT3** **Crops-Marginal System**	**LT4** **Livestock-Marginal System**	**LT5** **Urban-Oriented System**	**LT6** **Interme diate System**
Sample farms (*SYS03)*	*191*	*382*	*234*	*147*	*94*	*211*
Economic size (ESU)* (*SE005)*	10.54	23.23	5.55	5.72	10.49	6.14
Utilised agricultural area (ha) (*SE025)*	51.48	130.07	40.35	39.12	52.04	39.71
Total livestock units (LU/100 ha) *(SE080)*	20.08	9.63	26.46	35.73	25.85	28.88
Gross Farm Income *(SE410)*	227.25	208.60	184.05	182.23	211.41	205.01

Notes: The table reports the average FADN values in 2001-2003 years. * ESU = European Size Unit. GFI=Total value output-Intermediate Consumption+ Subsidies.

Source: own calculations based on the Czech FADN LA data.

Table 4 reports the gross farm income under the three policy scenarios and five Czech farming systems under the three managerial options. GFI value under Baseline scenario is taken as reference for comparisons. (a) Under Non-organic farm option, "Business as usual" scenario reports a significant increase of GFI values compared to "No-Accession" scenario. In relative terms, depending on the farming system, "No-Accession" scenario values are 13 % to

25 % lower than in baseline scenario. The higher amounts of CAP subsidies induce such outcome (since total output and intermediate consumption (not reported here) do not change). The effect of “Environmental CAP” scenario compared to “Business as usual” scenario in non-organic farms is rather modest. Since this farm type does not include organic or energy crops only the SFP decrease influences the GFI. Depending on farming system, the 1 % reduction of SFP induces a 0.49 % to 0.33 % GFI decrease.

(b) Organic farm option: According to results of the simulations at the 2013 time horizon, the EU accession of Czech Republic entails a significant increase of the GFI for organic farms compared to the non-accession alternative. Differences are rather high for CZ1 and CZ2 located in areas with good agricultural soils. While in the “No-Accession” scenario exclusively national subsidies are considered, the Baseline scenario includes organic aids and SFP that imply higher amounts. Differences among the standard farms also appear owing to their diverse agricultural structures (e.g. payments for meadows and pastures are low, while those for industrial crops, fruit-trees, vegetables etc. are higher). As a consequence, those standard farms having high shares of industrial crops or vegetables in their cropping structure report a higher GFI. Compared to “Business as usual” scenario, under the “Environmental CAP” scenario, GFI increases if specific payments to organic farming rise. It should be mentioned that the increase of the payments leaves relatively unaffected the GFI of the Czech organic farms: a 10 % increase of the organic aids hardly produces a 3 % rise in GFI.

(c) Under Energy crops farm option differences between “Business as usual” and “No-Accession” are observed, the relative values varying from 10 (CZ3) to about 20 percentual points (CZ5). Compared to “No-Accession” scenario, the GFI increase rates of energy crops farm in Baseline scenario is similar to the differences observed for the non-organic farms. Here the increases are slightly higher, in the sense that they include CAP payments for SFP and energy crops. The “Environmental GFI values are lower under the "Environmental CAP” scenario compared to baseline scenario. The reduction of SFP triggered by a 10 % increase of energy crops payments explains this outcome. The results indicate that the reduction of general subsidies exceeds the benefits from increasing the payments for energy crops which cover only a limited area of total farm land.

Table 4 Gross farm income at the 2013 time horizon under alternative policy scenarios and managerial options in the Czech Republic

Managerial options and Policy scenarios	**CZ1 Crops-Oriented Sugar Beet System** (€/ha)	**CZ2 Crops-Oriented Maize System** (€/ha)	**CZ3 Mixed-Oriented Grassland System** (€/ha)	**CZ4 Livestock-Oriented System** (€/ha)	**CZ5 Mixed-Oriented Potatoes System** (€/ha)
´non-organic farm´ option					
“Business as usual” (baseline)	487.40	457.08	280.25	482.16	357.71
“No-Accession”	370.02	344.27	244.61	390.47	268.23
“Environmental CAP”	485.68	455.4	278.87	480.56	356.09
´organic farm´ option					
“Business as usual”	406.62	440.02	235.05	384.57	348.65
“No-Accession”	202.23	220.94	158.67	226.45	196.36
“Environmental CAP”	419.02	454.42	241.86	394.47	358.25
´energy farm´ option					
“Business as usual” (baseline)	530.11	500.29	299.89	515.74	390.72
“No-Accession”	427.05	400.36	269.37	435.01	310.36
“Environmental CAP”	528.9	499.07	298.69	514.52	389.42

Table 5 reports the results of scenario simulations for Lithuanian farming systems. (d) Non-organic farm option: Under the Baseline scenario, this option triggers in 2013 a 50 % increase of GFI (compared to ´No Accession" scenario). This is the result of receiving SFP that represent a large share of the farm income. Under Baseline and “No-Accession” scenarios, differences among farming systems are not noticeable. Still, under the “Environmental CAP” the GFI falls as the increases of payments for organic farming and energy crops do not compensate for the loss of income triggered by SFP cut.

(e) Under Organic farm option the GFI values in “No-Accession” scenario are rather low for organic farms. This outcome is influenced by the data from 2005 field survey, i.e. organic yields are significantly lower than non-organic ones. Under baseline scenario assumptions, SFP and specific organic payments induce a notable GFI increase compared to "No-Accession" scenario. In absolute values, divergences between standard farms in marginal areas (LT3 and LT4) and those in areas with good quality soils (LT1 and LT2) reach almost 150 EURO/ha. In “Environmental CAP” scenario, 10 % increase of organic subsides generate more than 5 % rise in GFI in all but one (LT4) farming systems.

(f) Energy crops farm option: The GFI differences under baseline “No-Accession” scenario are similar to the case of non-organic farm option. For example, LT4 has a 58.02 % of the GFI, the highest one among standard farms in relative terms (the lowest is 46.67 % of the LT2 system). Overall, the differences among systems in terms of GFI are not very large, the SFP and energy crops accounting for most of the increase. Under the “Environmental CAP” scenario, the GFI values are lower than under Baseline. As in the case of Czech systems, these results imply that the increase of energy crops payments does not compensate for the GFI loss caused by the decrease in SFP.

Table 5 Gross farm income at the 2013 time horizon under alternative policy scenarios and managerial options in Lithuania

Managerial options and policy scenarios	**LT1** **Livestock -Oriented System** €/ha	**LT2** **Crops-Oriented System** €/ha	**LT3** **Crops-Marginal System** €/ha	**LT4** **Livestock -Marginal System** €/ha	**LT5** **Urban-Oriented System** €/ha	**LT6** **Inter mediate System** €/ha
´non-organic farm´ option						
“Business as usual” (baseline)	405.79	387.92	333.23	351.82	383.13	382.8
“No-Accession”	267.99	257.84	217.47	217.38	253.45	242.7
“Environmental CAP”	404.08	386.33	331.69	350.11	381.5	381.05
´organic farm´ option						
“Business as usual”	628.73	650.99	512.46	505.5	564.13	565.28
“No-Accession”	149.67	159.28	158.27	175.23	134.45	159.19
“Environmental CAP”	667.84	692.62	540.46	528.39	598.55	596.09
´energy farm´ option						
“Business as usual” (baseline)	446.69	430.93	360.19	372.12	417.18	413.38
“No-Accession”	302.61	293.81	240.16	235.49	283.42	268.62
“Environmental CAP”	445.61	430.05	359.08	370.62	415.95	412.11

5 CONCLUSIONS

Eleven farming systems were identified in the Czech Republic and Lithuania using a territorial approach. An index-based methodology was then applied to identify the economic, social and environmental dimensions of sustainability for each farming system. Finally, a synthetic sustainability index was constructed for each farming system and applied to rank them. For both countries, the leading dimension of sustainability varied among farming systems (economic one in the case of Czech specialised crops and Lithuanian crops and livestock systems; environmental dimension for Czech livestock orientated farming systems; two Lithuanian farming systems (livestock-marginal and urban-orientated) reported the highest values of the social sustainability index).

The impact of the 2003 CAP reform on the economic dimension of sustainability was further explored under the assumption that conversion to organic farming and/or growing energy crops signal changes towards more sustainable farming practices. Three prospective scenarios were developed and three policy instruments introduced under the 2003 CAP reform were considered (i.e. the single farm payment, organic farming support, and energy crops scheme). The policy scenarios assumed (a) continuation of the 2003 CAP (Baseline), (b) no Accession, and (c) a more environmentally-orientated CAP. Under the settings of each policy scenario, three alternative farm management decisions of a reference (non-organic) farm were considered: conversion to organic farming, adoption of energy crops, or continuation as a non-organic farm. The income position of each farming system (proxy for economic sustainability) was then simulated at the 2013 year horizon.

The results regarding sustainability dimensions are highly influenced by the methodology applied, particularly dependent on the data availability. More than anything else, they should be view as illustrating the method than definitive rankings of systems in terms of sustainability. The value of the methodology applied here rests in its flexibility, allowing incorporation of new variables, considered relevant by the local policymakers or new data becoming available for each sustainability dimension. The results of the policy scenarios indicate that in 2013, under Baseline scenario assumptions, Czech non-organic farming systems would reach the highest average GFI when adopting energy crops (447.3 Euro/ha compared to 412.9 Euro/ha in case of “no change” option and 363 Euro/ha for the “convert to organic” option), the additional payments and output explaining such outcome. In Lithuania, the Baseline scenario results suggest that conversion to organic farming would lead in 2013 to the highest average gross farm income (571.2 Euro/ha compared to 374.1 Euro/ha of the “no change” option) and “introduce energy crops” option (406.7 Euro/ha). The lowest average gross farm income is reported for the conversion to organic farming under No Accession Scenario alternative (200.9 Euro/ha in the Czech Republic and 156 Euro/ha in Lithuania). The high share of organic subsidies in the gross agricultural income of organic systems (over 70 % in the Czech Republic and above 80 % in Lithuania) under the Baseline scenario reflects a situation in which organic farming cannot be maintained on the long-term without subsidies, and more, that high payments do not automatically would enhance the economic sustainability. Obviously, the future of agriculture and rural areas in EU-N10 must involve coordination of sustainable activities, which should be environmentally respectful, economically viable, and socially acceptable. As agriculture continues to be one of the main economic activities in most of the EU-N10, further identification and analysis of the characteristics of existing farming systems from a sustainability perspective will be valuable input to the policy debate.

DISCLAIMER

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