Matej Bedrac, Tomaz Cunder

Agricultural Institute of Slovenia, Department of Agricultural Economics
Hacquetova 17, Ljubljana
matej.bedrac@kis.si
tomaz.cunder@kis.si

A model for evaluating the multifunctionality of agriculture in Slovenia

Abstract: *The primary aim of the present paper is to introduce a model which permits relevant, actual and continuous monitoring of the multifunctionality of agriculture in Slovenia and, using the model, to evaluate to what extent key elements of multifunctional agriculture were in fact influenced by recent agricultural policy goals and measures. Said evaluation was performed on various "multifunctionality elements" using available statistical data for the period examined. Based on selected socio-economic and spatial indicators, together with indicators of biological diversity, the model provides an efficient tool for assessing the effectiveness of agricultural policy and its impact on the different functions of agriculture. To evaluate the various multifunctionality elements of agriculture and to assess the effect of agricultural policy measures, the model comprises a qualitative assessment, quantitative assessment and the application of indicators of multifunctionality. Based on the collected set of production, environmental and social indicators used, the study points to an increased multifunctional role of agriculture and agricultural policy in Slovenia. The results furthermore show that the goals of agricultural policy in the period 1994-2004 were achieved to a great extent and that the multifunctional attitude of agriculture in Slovenia is increasing.*

Keywords: *multifunctionality of agriculture, evaluation model, agricultural policy*

Introduction

The "multifunctionality of agriculture" is a political-economic concept first mentioned in 1992 at the UN Earth Summit in Rio de Janeiro. In the professional and scientific literature, the term multifunctionality is often defined differently. Among the best-known and most frequently quoted definitions is the one developed by the Organization for Economic Co-operation and Development (OECD 2001), which

describes the multifunctionality of agriculture as a range of jointly produced commodity (food and fibres) and non-commodity outputs, including (both positive and negative) environmental and social products and services. Non-commodities share the characteristics of externalities, or public goods, which are not directly measurable. Because Slovenia is a member of the European Union, the most relevant definition for our purposes is provided by the socalled "European model of agriculture." Within the EU, agriculture is accepted as having a much broader role than simply the production of food. Thus, apart from its production function, agriculture serves such other vital functions as helping to preserve, manage and enhance rural landscapes, protecting the environment, including against natural hazards, and contributing to the overall viability of rural areas. European agriculture must also be able to respond to consumer concerns, for example those regarding food quality and safety (EC 1999). The EU's multisectoral development concept and diversification of economic activities lead to the creation of new jobs and sources of income whilst also respecting the multifunctional role of agriculture in rural areas. This should ensure both agricultural production and non-commodity outputs for society, whereas the key functions of agriculture in rural areas can be divided into the following categories:

- **The production function:** The primary function of producing food and raw materials for processing in order to secure the food supply and to provide safe, quality food at reasonable prices.
- **The environmental function:** Together, agriculture and forestry manage the largest share of the countryside and thus contribute to the sustainable use of natural resources, the conservation of biological diversity and cultural landscapes, and to the appearance of the natural and cultural heritage which have formed in the countryside over the centuries.
- **The social function:** Preserving the rural population and assuring balanced spatial development across all areas are two of Slovenia's top development priorities. Agricultural activities remain generators of development in remote and outlying areas where a lack of other employment opportunities exist. The continuation of agricultural production and the development of new on-farm and off-farm activities thus contribute to the maintenance of the rural population and labour force.

Slovenia has stressed the importance of multifunctional agriculture in national strategy papers. Indeed, the longterm objectives of agricultural policy as identified in the Slovenian Agricultural Development Strategy of 1993 emphasise the social role of agriculture. In the late 1990s, agricultural policy reforms furthermore enabled the establishment of mechanisms which, for the most part, still today pursue the objective of promoting the non-production functions of agriculture. By joining the European Union and integrating its Common Agricultural Policy (CAP), Slovenia now fully adheres to the European model of multifunctional agriculture.

In the past, monitoring and evaluating development programs and projects was not a regular practice in Slovenia. Whilst the evaluation of EU policies alrea-

dy became an important component of development planning with the reform of structural funds in 1988, Slovenia did not introduce a system of current and multiple evaluation until the country's inclusion in EU development programmes.

Recently, several research projects dealing with the evaluation of agriculture's multifunctional role (MULTAGRI, SEAMLESS, MEA-Scope) have been conducted, resulting in the development of tools and indicator sets for monitoring the production, environmental and social functions of agriculture.

Within the framework of the MULTAGRI project (Zander et. al. 2005) a survey of various models and indicators used for the assessment of policy was conducted. These are grouped as follows:
- Models used for the preliminary evaluation of policy
- Tools used for the implementation of policy
- Tools used for supplementary assessment

Models for the preliminary evaluation of policy are further divided into macroeconomic simulation models and bio-economic models, through which the assurance of commodity and non-commodity goods can be assessed. Macroeconomic models are very adequate for the preliminary analysis of market mechanisms and the study of links between different sectors. However, due to difficulties with respect to joining data, as well as their static character, these models are not suitable for the analysis of environmental and social functions. Among bio-economic models, linear programming is useful on the level of agricultural holdings and on the regional level, and it is the most widely used. Specifically, linear programming is used to present different scenarios related to policy measures in which the environmental function of agriculture serves as the limiting factor for the use of agricultural land. Some models on the regional level combine agri-environmental and economic models to assess the most appropriate use of agricultural land.

Policy implementation tools serve to analyse the effectiveness of agricultural holdings by applying various economic, environmental and social indicators. These tools are used to optimise environmental attitudes regarding agricultural holdings, to help control environmental payments and to help determine the value of compensation payments.

In the Netherlands, supplementary assessment tools are used to examine linkages between the use of agricultural areas and biodiversity. The resulting models serve a limited number of functions (biodiversity and maintenance of the countryside) and are thus frequently applied to specific areas only. Supplementary tools would require further development before they could also be used in preliminary assessments.

The international SEAMLESS project is part of the 6th EU Framework Programme and aims to develop a complex framework for the preliminary assess-

ment of agricultural and environmental policy, which would allow assessment on all levels (on the level of agricultural holdings, and the EU and global level). The framework enables an analysis of the contribution made by the environmental, economic and social functions of multifunctional agriculture towards the sustainable development of rural areas and the vitality of rural regions. It takes into consideration a very broad spectrum of varied content, such as climate change, environmental policy, rural development measures, the impact of EU accession, international competitiveness and influences on developing countries. The project innovatively combines bio-physical and economic models on the farm level using a macroeconomic approach; however, the extent to which it takes into account environmental and social functions is limited. Questions thus arise as to the degree to which these types of approaches are compatible with a qualitative approach for assessing the impact of policy.

Description of Methodology

Our model for evaluating the various multifunctionality elements of agriculture and assessing the impact of agricultural policy consists of three components:

Qualitative assessment: This component examines measures related to market price policy, structural policy and rural development policy to determine the level of representation of individual multifunctionality elements in the goals and content of agripolicy measures as a whole.

Quantitative evaluation: This is an upgraded form of qualitative assessment. We transformed the qualitative assessment results into numerical values and then calculated the relative partial contribution of individual measures of agricultural policy in relation to the total calculated score, whereas the total score stood in direct connection with the amount of annual funding (from the agriculture budget) spent on individual measures. In this fashion, we obtained an overall assessment which indicates to what extent individual agricultural policy measures contribute to selected elements of multifunctionality and the multifunctional role of agriculture.

Multifunctionality indicators: This third component of the model relies on established indicators. Many different concepts of indicators of sustainable development and of rural area development have been developed in the professional and scientific literature and thus have essentially also become indicators of multifunctional agriculture.

Qualitative assessment of multifunctionality in the goals and content of agricultural policy measures

The fundamental purpose of this section is to assess the representation of multifunctionality elements in individual strategy papers and implementation measures of Slovenian agricultural policy during the period from adoption and enforcement of the Agricultural Development Strategy to the country's membership in the EU. First, we shall provide a brief overview of the de-

velopment of agricultural policy in Slovenia during this period, as well as a descriptive analysis of individual strategy papers and a qualitative assessment of the multifunctionality of agriculture at the level of individual measures. The information was derived mainly from the available academic literature, legislative literature and statistical sources.

A qualitative assessment of the multifunctionality of agriculture, which extends to market price policy measures as well as measures of structural and rural development policy, relies on two indicators. Comprising three different levels each, these indicators are:
- The level of representation of individual multifunctionality elements in the objectives of agripolicy measures
- The level of representation of individual multifunctionality elements in the content of agripolicy measures.

For the assessment, we used a "+" sign to indicate those measures on the target or implementing level which were assessed to directly affect individual elements of multifunctionality and the symbol "O" to indicate measures which indirectly impact the multifunctionality of agriculture (see Table 1, page 6). Measures which do not affect elements of multifunctionality are furthermore indicated with a "-" sign, whilst the cells of measures which were not implemented during the observed period remain empty.

We grouped the measures within similar categories, just as they are grouped in a regular analysis of the structure of the agricultural budget. In order to cover the different periods of agricultural policy in Slovenia in terms of content and targetorientation, we performed an analysis covering the reference years 1994-2004, which we then divided into three phases:
- The period from 1994 to 1998, which was the enforcement period for the Slovenian Agricultural Development Strategy
- The period from 1999 to 2003, or implementation period for agricultural policy reforms
- The period after 2004, or period of EU entry and subsequent full membership

The enforcement period for the Slovenian Agricultural Development Strategy

The Slovenian Agricultural Development Strategy is the policy document in which the national agricultural policy for the first time clearly defined the concept of multifunctional development. The longterm development objectives of the strategy are:
- The stable production of quality food at reasonable prices and food security
- Retention of the population in rural areas, the preservation of cultural landscapes and of the agricultural production potential, and protection of agricultural land and water from pollution and misuse
- A permanent increase in competitiveness
- Guaranteed parity income in agriculture (MAFF 1993)

Beyond food production, a significant territorial, environmental and social role of agriculture is given. The Slovenian strategy thus incorporates the ecosocial concept of agricultural development, which emphasises population retention, maintenance of the cultural landscape and ecological acceptability over the production function of agriculture (MAFF, 1993) and which is characterised by moderate intensity, nutrition balance and the cultivation of all agricultural lands. This concept indicates the direction of Slovenian agricultural development whilst at the same time emphasising an active role for the state and a relatively significant amount of funding for the agricultural budget (MAFF 1993).

The ultimate objective of market price policy during this period was to reverse the fall in prices of agricultural products and to increase agricultural incomes. By the mid-1990s Slovenia's growing integration within international markets prompted a new turn in agricultural policies. Not only did WTO membership necessitate a shift to less distortive types of support, but the commitment to decrease the level of border protection also made sustaining open-ended price supports highly problematic. This resulted in a need for more targeted and less productionlinked measures. Thus, in 1995, Slovenia began introducing area and headage payments whilst, in parallel, reducing price aids and input subsidies.

The implementation period for agricultural policy reform

The reform of agricultural policy in 1998 did not lead to significant changes in the definition of the fundamental goals of Slovenian agricultural policy. These remained practically the same and were not substantially deviated from the objectives of the EU Common Agricultural Policy. In 1998 the government adopted the Agricultural Policy Reform Programme 1999-2002, and in 1999 the National Development Programme for Agriculture, Food, Forestry and Fisheries for the period 2000-2002. The main thrust of this reform effort was the reinstrumentation of agricultural policies to achieve their stated goals more effectively and efficiently. This can generally be characterised as a shift from market price support to direct payments and a greater emphasis on structural, environmental and rural development measures. The four major pillars of the reform are:

- Pillar I: Market price policy
- Pillar II: The Slovenian Agricultural and Environmental Programme
- Pillar III: Restructuring of agriculture and the food industry
- Pillar IV: Rural development measures

The resulting agrienvironmental payments aimed at promoting environmentally friendly farming methods which emphasise the multifunctional role of agricultural production as reflected in the public function of maintaining landscapes and biodiversity, as well as preserving the population in the Slovenian countryside by taking into account ecological, social and spatial settlement patterns in rural areas.

Ultimately, the increased number of measures together with the structural reform of market price and rural development policies served to enhance the multifunctionality of agriculture.

The period of full EU membership

The period of agricultural policy reform came to an end upon Slovenia's joining the EU and integrating the Common Agricultural Policy. To a large extent, this resulted in a transfer of competence to the EU in terms of planning and implementing agricultural policy – holding particularly true for the market price policy, which experienced substantial changes after Slovenia became an EU member. With respect to structural and rural development policies, the year 2004 also brought significant changes in the primary area of planning policy, for which Slovenia prepared two important documents: The Rural Development Programme for the Republic of Slovenia 2004-2006 (RDP) and the Single Programming Document for the Republic of Slovenia 2004-2006 (SPD). The two documents served as the basis for comprehensive planning, implementation and monitoring of rural development policy in Slovenia. The priorities of the RDP 2004-2006 were as follows:

- Sustainable agriculture and rural development: This priority led to the implementation of measures targeting less favoured areas and measures deriving from the Slovenian Agri-Environmental Programme.
- Economic and social restructuring of agriculture: This priority led to the implementation of two specific measures: the early retirement of farmers and the meeting of EU standards. In terms of structural policy, the early retirement measure was an entirely new introduction aimed at improving the age structure of farmers and the social status of older farmers. Implementing EU standards for agricultural holdings also represented a novelty, with the intention here being to speed up the adjustment of agricultural holdings in terms of meeting environmental protection, plant health and work safety requirements. Both of these measures will continue to make an important contribution to the social and environmental functions of agriculture.

Adopted in late 2003, the Single Programming Document 2004-2006 (SPD) sets forth how Slovenia will spend available funds from the EU's Structural Fund and Cohesion Fund, and from the national budget. In the field of agriculture the following measures were carried out:

- Improvements to the processing and marketing of agricultural products
- Investments in agricultural holdings
- Diversification of agricultural activities and other activities "close to agriculture"
- The marketing of quality agricultural and food products

The Common Agricultural Policy reform – adopted in June 2003 and fully implemented in all EU Member States in 2007 – places further emphasis on the multifunctional role of European agriculture. The most significant change is the introduction of decoupled payments, in the form of single payment. In

order to obtain direct payments under the CAP reform, agricultural holdings must fulfil the conditions of cross-compliance whilst agricultural areas must be treated in accordance with good agricultural practices.
Table 1 below summarises the results of a sample qualitative assessment performed to determine the representation of multifunctionality elements in the objectives and content of Slovenian agri-policy measures under consideration of the three key functions of agriculture.

Table 1. Sample Qualitative Assessment of elements of multifunctionality in the objectives and content of agri-policy measures (1999-2003)

1999/2003	Production function			Environmental function			Social function	
	Food production	Food safety	Food security	Sustainable use of resources	Biodiversity	Maintenance of cultural landscapes	Population retention	Employment
Market price policy measures								
Export subsidies	- -	+ O	- -	- -	- -	- -	- -	- -
Direct payments (ha, head)	+ +	O O	+ +	+ O	- -	+ O	+ O	+ O
Reduction of input costs	- -	- -	- -	- -	- -	- -	- -	- -
Consumer support	- -	O O	- -	- -	- -	- -	- -	- -
Structural and rural development policy measures								
Less favoured areas	+ +	- -	+ +	+ +	- -	+ +	+ +	+ +
Reduction of negative impacts of agriculture	- -	+ +	- -	+ +	O O	+ +	- -	- -
Conservation of natural conditions	- -	- -	- -	+ +	+ +	+ +	- -	- -
Maintenance of protected areas	- -	- -	- -	+ +	O O	+ +	+ +	+ +
Investment and restructuring of agriculture	+ +	+ +	+ +	+ +	- -	- -	+ +	+ +
Restructuring of the food processing industry	- -	+ +	+ +	O O	- -	- -	O O	+ +
Diversification of activities in the countryside	- -	O O	+ +	O O	- -	O O	O O	O O
Integrated rural development	+ +	+ +	O O	+ +	- -	+ +	+ +	+ +

+ The measure directly affects the individual elements of multifunctionality of agriculture
- The measure does not affect the individual elements of multifunctionality of agriculture
O The measure indirectly affects the individual elements of multifunctionality of agriculture

Total budgetary expenditures in support of agriculture increased almost sevenfold during the period 1994-2004. In addition, expenditures on market price policy measures amounted to 34% of all agricultural subsidies (on average) for the years 1994 to 1998, with the share increasing to nearly 50% during the period 1999-2003. The transition to direct payments per hectare was thus determined to increase the multifunctional orientation of agriculture.

With respect to structural and rural development policy measures, expenditures averaged roughly 35% of the total budgetary support to agriculture from 1994 to 1998. In the period 1999-2003, this share fell to approximately 25% due to increased spending on market price policy measures. However, in 2004 it again increased to 34%.

Structural policy measures can be broken down into compensatory payments and development support. These payments are market-neutral and directly emphasise the multifunctional role of agriculture. In the first period, 45% of all funding for structural policy measures was spent on compensatory payments, with nearly 95% dedicated to the support of less favoured areas and only 5% being agri-environmental payments. After the Slovenian reform of agricultural policy, the share of agri-environmental payments increased significantly, amounting to 20% in the years 1999-2003 and 47% in 2004, on average. Support for less favoured areas provides a typical example of the changing forms of payments and increasingly multifunctional role of agriculture. Before the reform, more than half of all support to less favoured areas was in the form of price allowances whilst only 40% was via crop-specific payments paid per head or per hectare. Since 2000, all farms with land listed among less favoured areas have been entitled to compensatory payments and the absolute amount spent on less favoured areas has thus increased significantly.

A similar situation can be observed for agri-environmental measures. The budget share dedicated to agri-environmental payments during the period 1994-1998 amounted to less than 1% of total expenditures in support of agriculture. After the reform of agricultural policy during the period 1999-2003, this percentage increased to 3% as a result of the adoption of the Slovenian Agri-Environmental Programme (SAEP) and the addition of new sets of measures. By 2004, the share had increased to almost 7%.

Measures related to investment and the restructuring of agriculture and rural development received over half (54%) of all structural policy funding during the first period, with expenditures growing each year within the period and reaching a peak in 1998. In the next period, budgetary support for this group of measures began to decline and dropped to 46% in 2002. Finally, budgetary support for the group increased significantly in 2004, to 58%.

Quantitative evaluation of multifunctionality elements

Quantitative evaluation is an upgrade of the qualitative assessment of multifunctionality previously performed on the goals and content of agricultural measures. For the first phase of the quantitative evaluation we changed the qualitative assessments into numerical values as follows:

- Each “+” received 2 points
- Each “O” received 1 point
- Each “-” received 0 points.

Using the numerical values, we first calculated the relative share of each agricultural policy measure in relation to the total score for each period. In the next stage we combined these shares with the annual funding (from the agricultural budget) for each measure and in this fashion determined point estimates. These point estimates show how the multifunctional role of agriculture changed during the examined years in relation to the individual measures, whilst the sum of all point estimates indicates which measure contributed the most to the individual elements of multifunctionality and to the overall multifunctionality of agriculture.

Table 2 shows the funds spent on the market price support measures and structural policy measures which best promote the multifunctionality of agriculture. In the period 1994-2004 the majority of funds were dedicated to direct payments, export promotion payments and measures for the reduction of input costs. Among the measures contained in structural and rural development policies, the majority of funding went to less favoured areas and investment in the restructuring of agriculture. In recent years the share of agri-environmental payments has increased.

The results of our quantitative analysis (Table 3) indicate that direct payments, with 37%, had the greatest impact on promoting the production and non-production functions of agriculture. Support for less favoured areas follows with 26% whilst support for investment and the restructuring of agricultural production has a 15% share.

With respect to the key functions of agriculture during the period, the importance placed on the production function continually decreased, with its share dropping from 47% to 39% in the period 1994-2004. A changing relationship within the production function of agriculture was also observed. The basic agricultural function of "food production" fell during the period from 21% to 13% whilst "food security" declined from 20% to 12%. However, the impact of "food safety and quality" increased significantly, as this share increased from 5% in the period 1994-1998 to 14% in 2004.

In the same period, the role of the environmental and social functions of agriculture increased markedly, with the share for the environmental function of agriculture alone growing from 22% in the period 1994-1998 to 29% in 2004. Measures to ensure the preservation of the rural population and employment – which are elements of the social function of agriculture – were implemented continuously throughout the period 1994-2004. The effort to ensure the environmental and social functions of agriculture furthermore fully complies with the second objective of agricultural policy as defined in the Slovenian Agricultural Development Strategy, which emphasises the preservation of population, cultural landscapes and agricultural land, as well as the protection of agricultural land and water from pollution and excessive use.

Table 2. Agricultural budget for market price policy measures and structural and rural development measures 1994-2004 (m €)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Total
Market price policy measures												
Export promotion payments	7.3	9	9.2	12.8	15.1	32.3	26.8	34.5	25.4	29.4	26	227.8
Other measures for market stabilisation	0.8	0.6	0.1	0.1	1.6	5.4	0.4	0.4	1.4	0.9	0.2	11.9
Price aids per tonne, l	2.3	0.8	1.4	0.7	2.3	2	0	0	0	0	0	9.5
Direct payments per hectare, head	0	3.5	3.8	7	9.2	18.9	29.5	37.9	46	49.5	59.3	264.6
Reduction of input costs	7.1	7.5	6.6	6.1	3.3	0.3	1.1	1.8	3.1	3.1	2.4	42.4
Consumer support	0	0.2	0	1.5	1.7	1.6	0.5	1.2	2.7	1.7	1.2	12.3
Structural and rural development policy measures												
Less favoured areas	7.5	11.4	11.2	11.6	10.8	10	18.2	16.6	21.1	18.8	17.7	154.9
Reduction of negative impacts of agriculture	0	0	0	0	0	0.8	1.7	3.6	5	5.2	8.1	24.4
Conservation of natural conditions	0.9	0.6	0.5	0.5	0.4	0	0	2.8	2.9	2.7	6.6	17.9
Maintenance of protected areas	0	0	0	0	0	0	0	0	0,3	0.4	0.6	1.3
Investments and restructuring of agriculture	6.4	6.2	8.7	9.4	13.5	12.6	7.1	7	4	7.1	16.6	98.6
Restructuring of the food processing industry	0	0	0.4	2.5	2.4	1.3	5.6	3.9	2.3	8.3	17.2	43.9
Integrated rural development	1.5	1.7	1.9	3.2	4.2	5.8	2.6	6.1	5	5.8	9	46.8
Total	**33.8**	**41.5**	**43.8**	**55.4**	**64.5**	**91**	**93.5**	**115.8**	**119.2**	**132.9**	**164.9**	**956.3**

Source: MAFF 2006

Table 3. Quantitative evaluation of the elements of multifunctionality for selected groups of measures

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Total
Market price policy measures												
Export promotion payments	0.15	0.18	0.18	0.26	0.30	0.62	0.52	0.67	0.49	0.57	0.62	4.56
Other measures for market stabilisation	0.02	0.01	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.06
Price aids per tonne, l	0.19	0.06	0.12	0.06	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.61
Direct payments per hectare, head	0.00	0.55	0.61	1.12	1.47	2.69	4.19	5.38	6.53	7.03	8.42	38.00
Reduction of input costs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer support	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.01	0.03	0.02	0.01	0.11
Structural and rural development policy measures												
Less favoured areas	1.50	2.28	2.23	2.33	2.15	1.62	2.94	2.67	3.40	3.03	2.61	26.76
Reduction of negative impacts of agriculture	0.07	0.05	0.04	0.04	0.03	0.07	0.16	0.32	0.45	0.47	0.77	2.48
Conservation of natural conditions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.22	0.21	0.78	1.43
Maintenance of protected areas	0.51	0.49	0.70	0.75	1.08	0.00	0.00	0.00	0.04	0.05	0.07	3.70
Investments and restructuring of agriculture	1.09	1.05	1.48	1.60	2.29	1.94	1.10	1.09	0.63	1.09	2.36	15.73
Restructuring of the food processing industry	0.06	0.06	0.09	0.09	0.13	0.14	0.58	0.41	0.23	0.86	1.22	3.87
Integrated rural development	0.03	0.03	0.04	0.06	0.08	0.83	0.37	0.87	0.71	0.83	1.17	5.02
Total	**3.61**	**4.78**	**5.50**	**6.32**	**7.77**	**7.93**	**9.86**	**11.64**	**12.73**	**14.16**	**18.04**	**102.34**

Source: MAFF 2006, calculations by the Agricultural Institute of Slovenia

Indicators for the evaluation of the multifunctional role of agriculture

Many different concepts of indicators of sustainable development and of rural area development have already been developed in the professional and scientific literature and thus have essentially also become indicators of multifunctional agriculture. An indicator shows how things change in space and time. In addition, an indicator has a meaning which surpasses the communication properties directly associated with the given data value; it has a synthetic role and has been developed for a purpose determined in advance (Radej 1999).

The greatest difficulty may be presented by the aggregation of indicators, since the multifunctional role of agriculture is influenced by a broad spectrum of factors described with various measurement units and systems which are not directly comparable with another. For the standardisation of indicators, the model uses the method of standardised value (z score[1]). This statistical method allows comparisons of different data series and expresses the relative position of individual data in the series. In the form of a relatively simple expression it may be illustrated as:

$$z = \frac{X - \overline{X}}{\sigma_X}$$

z: standardised value
X: individual data in a series

$\overline{X}$: average of a series

σ_X : standard deviation

In the paper a slightly modified method of standardised value is used since all indicators are shown in the form of marks. The highest absolute deviation of the average value within the period discussed was presented as a criterion.

a: relative assessment
X: individual data in a series
$\overline{X}$: average of a series

The value of calculated assessment ranges from +1 to -1. In order to avoid assessment to several decimal places we chose to assess in the range from -5 to +5.

$$TO = a * 5 = \frac{X - \overline{X}}{\max\left|X - \overline{X}\right|} * 5$$

1 http://www.mathtools.net/Java/Statistics/

TO: assessment for individual indicator in a series
X: individual data in a series
$\overline{X}$: average of the series

In this fashion all indicators in a time series are assessed uniformly, but at the same time these assessments point at all characteristics of original series of indicators. Indicators expressed in the form of assessment have the following characteristics:

If TO>0<=+5 then X> $\overline{X}$
If TO<0>=-5 then X< $\overline{X}$
If TO=0=then X= $\overline{X}$

The relation of original indicators to the assessment is as follows:

$$X = \overline{X} + \frac{TO}{5} * \max\left|X - \overline{X}\right|$$

TO: assessment for individual indicator in a series
X: individual data in a series

$\overline{X}$: average of the series.

The effectiveness of agricultural policy on the different elements of multi-functional agriculture is described with numerical values. Each indicator is assessed with numerical values from -5 to +5. If the assessment approaches the value +5 the agricultural policy goal was fulfilled.

In order to make such an interpretation universal, a positive assessment means approaching a goal also in cases where the target value of an indicator is lower, meaning that the level of the indicator must be lower to be able to accomplish the goal (e.g. the use of mineral fertilisers). To conform to such an understanding of assessment some indicators require correction of the sign of this type of assessment.

$$TOgoal = TO * f$$

Target value<from the starting $\longrightarrow f$ =-1

Target value>from the starting $\longrightarrow f$ =1

For the assessment of the realisation of agricultural policy goals we also used linear trend calculations, which especially ensure assessment when the oscillations within the individual data in the series are large (Volk 2004). In terms of calculating the linear trend (y‘ = mx+b; x=1, 2… n) we were interested

in the trend coefficient (m), which reflects the direction and intensity of the change. The trend coefficient is calculated as:

$$m = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum(x^2)) - (\sum x)^2}$$

m= trend coefficient
n= number of years
x= serial number of years (1,2...n)
y= individual data in the series (TO goal)

The interval which defines whether the goals of agricultural policy were achieved is calculated as follows:

$|m| =\leq \frac{1}{n} \longrightarrow$ No change "="

$m =< \frac{1}{n} \longrightarrow$ Positive trend towards agricultural policy goals "Yes"

$m => \frac{1}{n} \longrightarrow$ Negative trend towards agricultural policy goals "No"

In the observed period 1994-2004 (n=11) the interval for positive or negative assessment of agricultural policy goals is ±1/11= ±0.091.

The assessment system described was used for all indicators over the complete time series (on a yearly basis). For purposes of illustration, a uniform table of indicators was prepared which contains the name and definition of each indicator, the source of data used or available, the temporal scope and territorial level, and the element of multifunctional agriculture to which each indicator applies.

The proposed system of indicators presents an additional policy evaluation tool and assessment option. Indicators used to assess the effectiveness of agricultural policy and the multifunctionality elements of agriculture were grouped under the three basic functions of agriculture. We thus distinguished between the indicators according to their ability to describe the production, environmental or social function of agriculture.

The production function is divided into the following multifunctionality elements:

- Production of food (indicators: index of agricultural production volume and import-export balance), assurance of food safety and quality (indicator: funds invested in the food processing industry).
- Assurance of food supply (indicators: share of expenditures spent on food production by agricultural holdings and the self-sufficiency level for major agricultural products)

- For the assessment of the environmental functions of agriculture we used indicators which were developed within the research project "Biodiversity as a Source of Economic Development" (Slabe Erker 2003) and agricultural-environmental indicators developed within the framework of the project "Preparation of Indicators of Agriculture and Environment" by the Agricultural Institute of Slovenia.
- The environmental function is divided into the following elements of multifunctionality:
- Sustainable use of natural resources (indicators: area of agricultural land in use, area of land with applied agricultural-environmental measures, share of agricultural land applying ecological agriculture, use of mineral fertilisers in agriculture and the number of participants active in education as part of the SAEP)
- Assurance of biodiversity (indicators: total number of varieties of agricultural plants registered for selling and the hectare yield of wheat)
- Preservation of the cultural countryside (indicator: increase in the share of protected natural regions).
- The social function of agriculture is described by two elements of multifunctional agriculture:
- Preservation of the rural population (indicator: the share of population living in rural areas in relation to the total population – since population preservation is indirectly influenced by the degree of education and improvement in employment opportunities, in future it would be reasonable to also use the following two indicators: number of farmers with a formal agricultural education and share of agricultural holdings with supplementary activities).
- Assurance of employment for the rural population (indicators: number of full-time labourers employed in agriculture according to the economic budget of agriculture, index of factor income according to annual work units (AWU) with regard to the index of average annual wages)
- Selected indicators were classified in groups as per the agricultural policy goals defined in the Slovenian Agricultural Development Strategy. Table 4 presents the results and the trend of changes indicating to what extent the goals of agricultural policy were realised during the observed period.

Table 4. Assessment of relative changes in basic indicators of multifunctional agriculture used for assessing the realisation of agricultural policy goals

Assessment												
Goal/Indicator	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**Trend**
Stable production of quality and affordable food, and assurance of food safety												
Index of agricultural production volume	0	-2	0	0	0	-1	0	-1	2	-3	5	+0.24
Import-export balance	1	-4	-2	-2	0	1	2	2	4	3	-5	+0.22
Share of expenditures for food	5	3	3	0	0	-2	-2	-2	-2	-3		- 0.83
Degree of self-sufficiency (%) Cereals	0	0	-1	2	3	-1	-2	-3	3	-5	2	- 0.11
Degree of self-sufficiency (%) Beef	-4	-3	-2	1	0	-1	-1	5	4	2	-1	+0.58
Degree of self-sufficiency (%) Pork	-1	0	5	-2	-1	2	-3	0	-3	4	-1	- 0.01
Degree of self-sufficiency (%) Poultry	5	5	2	-1	-2	-1	-2	-1	-2	-1	-1	+0.62
Degree of self-sufficiency (%) Milk	-3	-2	-3	-5	3	5	2	2	0	2	-1	+0.48
Restructuring of the food processing industry				-1	-1	-2	0	-1	-1	1	5	+0.68
Increased competitiveness of agriculture												
Average UAA/holding				-4			-1			5		+4.72
Maintenance of production potential, environmental protection, rural development												
Agricultural land in use (total)	5	3	1	-2	-3	-2	0	0	0	0	-3	+0.41
Surface of land with agricultural environmental measures						-3	-3	0	0	1	5	+1.50
Share of UAA with ecological agriculture						-5	-3	-1	1	3	5	+1.97
Use of mineral fertilisers	2	-3	-3	2	3	4	-1	1	0	0	-5	-0.18
Number of varieties registered and certified for selling				-5	-5	1	1	0	3	3	2	+1.09
Hectare yield of wheat	0	0	-2	-1	3	-3	0	2	4	-5	2	+0.06
Share of protected natural districts in Slovenia									-3	-2	5	+3.91
Assurance of adequate income												
Share of population in rural communities (vs. total population)						5	0	-1	-1	-1	-2	-1.11
Number of employed persons (thousand AWU)	-2	1	2	3	0	0	-1	4	1	-5	-2	+ 0.27
Index of factors income acc. to AWU/Index of average yearly gross wages	4	-3	-2	1	-2	-1	0	-2	2	-3	5	+ 0.12

The production function of agriculture played a major role in the observed period. The quantitative assessment of the multifunctionality element "stable production of quality and affordable food, and assurance of food safety" shows the changes in indicator values during individual years. Assessment of the change trend shows that the applied measures of agricultural policy contributed a great deal to realising this agricultural policy goal.

The index of agricultural production volume increased slightly during the observed period, however it should be pointed out that the weather conditions, primarily, have a great influence on plant production volumes. This is clearly evident for 2003, when the weather conditions for plant production were extremely unfavourable. The share of household expenses for food decreased throughout the period, which indirectly means that Slovenia produces relatively affordable food having a high quality. Our assessment of the degree of self-sufficiency for major agricultural products indicates an increase in self-sufficiency for beef and milk. This is reflected in the processes of specialisation for these two product types, which may have an unfavourable impact with respect to assuring the multifunctionality elements relevant to the environmental function of agriculture.

A positive trend was also observed regarding the restructuring of the food processing industry, for which substantial funds were devoted to modernising production lines and to assure environmental and hygienic standards, as well as the production of safe, quality food during the recent period. This would also mean that the element directly contributes to assuring the non-production functions of agriculture.

It may be argued that the competitiveness of agriculture has also increased, since the utilised agricultural area (UAA) per agricultural holding increased significantly in the period from 1997 to 2003. Essentially, this is due to the reduction in the number of agricultural holdings, which in turn has not brought about an increase in the intensity of agricultural production – whilst the latter may be attributed to the introduction of agri-environmental measures.

The results also indicate that agricultural environmental measures directly influenced the assurance of the environmental function of agriculture. In addition, the quantitative assessment of indicators shows that after 1999 the importance of the environmental function increased significantly and that the related measures received a favourable response among producers.

The social function of agriculture serves the fundamental role of preserving population and employment in rural areas. The trend for both of these multifunctionality elements during the observed period would indicate that agricultural policy measures which promoted the two goals were relatively successful, in spite of the fact that the number of persons employed in agriculture and the share of inhabitants living in rural areas decreased during the period. The reason for this conclusion is that we were able to confirm that both decreases would have been significantly larger had the agricultural policy measures not been applied.

Conclusions

The meaning and role of multifunctional agriculture was originally set forth in the Slovenian Agricultural Development Strategy of 1993. Our application of the described model for assessing the influence of agricultural policy on the multifunctionality elements of agriculture has confirmed that important linkages exist between the objectives of Slovenian policy measures, selected sets of indicators and the elements of multifunctional agriculture. The results indicate that the agricultural policy goals were achieved to a great extent during the observed periods and that the multifunctional attitude of agriculture in Slovenia is on the rise. In addition, it may be concluded that Slovenian agricultural policy measures have become increasingly target-oriented, which in turn has had an indirect impact on improving the assurance of agriculture's non-production functions. At the same time, increasing the available set of indicators would undoubtedly contribute to a better applicability of the model for the evaluation of multifunctionality, planning and implementation as these relate to the policy measures which influence the different functions of agriculture.

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