European Association
of Agricultural Economists

100th Seminar of the EAAE

DEVELOPMENT OF AGRICULTURE
AND RURAL AREAS
IN CENTRAL AND EASTERN EUROPE

Thematic Proceedings
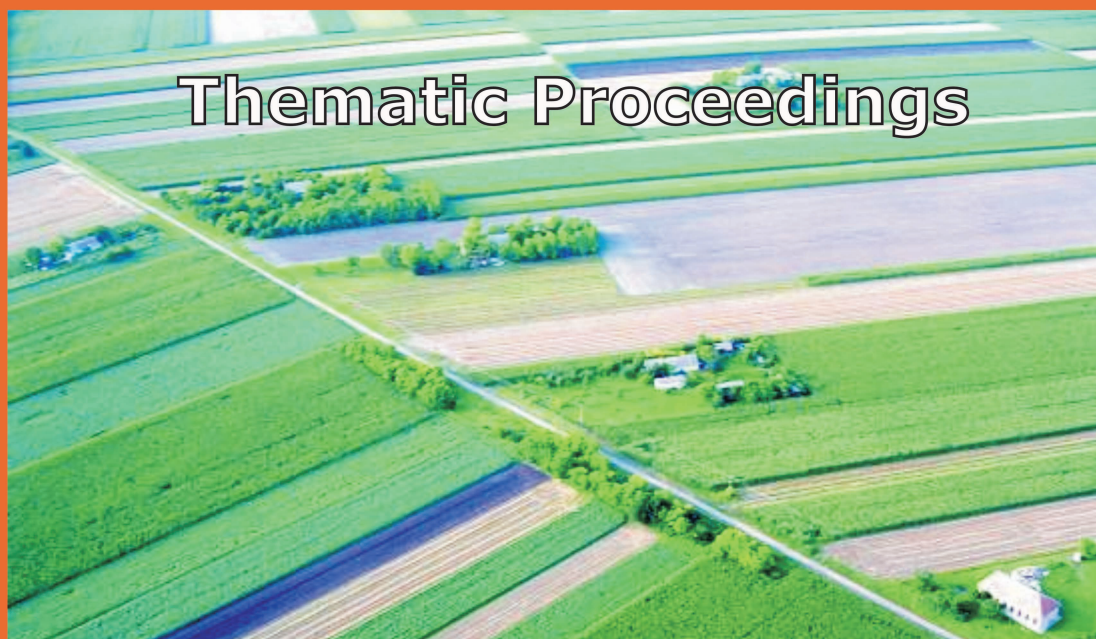
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REGIONAL CHAMBER OF COMMERCE NOVI SAD

21st – 23rd June 2007
Novi Sad, Serbia

Serbian Association
of Agricultural Economists

EAA-ABTA MODEL FOR EX-POST AND EX-ANTE ANALYSIS OF ECONOMIC POSITION OF SLOVENIAN AGRICULTURE

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INTRODUCTION

Analyses and forecasts of the economic situation in agriculture form the crucial basis for the public strategic studies as well as for the agricultural policy decision making. They have to be based on an understanding of the functioning of particular phenomena in the past (*ex-post*), and to an ever greater extent, on the study of expected trends in the always unpredictable future (*ex-ante*). The quality of the analyses depends upon the availability and quality of data and the use of proper empirical tools.

In the EU member states, *ex-post* analyses are commonly based on the Economic Accounts for Agriculture (EAA), which provide a systematic, comparable and complete overview of economic parameters in the sector (Eurostat, 2000). EAA consists of output data by product (quantities and values), intermediate consumption data by type of input as well as of data on consumption of fixed capital, which enable calculation of different income categories and other economic indicators on the aggregate level. If EAA is expanded by the Activity Based Table of Accounts (*ABTA),* it can be used also for the static analyses of income on the level of individual activities. Although for relatively rough short-term estimates of the impacts of changes of different economic parameters, i.e. prices and policy measures, the production volume changes can be ignored, for medium or long-term forecasts this is hardly acceptable. Changes in production volume are well explained by partial equilibrium models.

There are many relevant partial equilibrium models for producing the market outlooks for key markets at the national and multi-national level (FAPRI, OECD-FAO, GTAP). Among newest models are the models build by AGMEMOD Partnership. AGMEMOD Partnership consists of national agricultural experts from all EU-27 member states, whose goal is to develop a model for forecasting economic trends on agricultural markets at the EU level as well as at member states' level. The aim of the Partnership is to project and run policy simulations in

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each country's agricultural sector and at the aggregate EU-27 level (Chantreuil, Levert, Hanrahan, 2005).

This paper is an attempt of combining the EAA/ABTA model with the AGMEMOD partial equilibrium sector model for Slovenia. The results of the estimates obtained by AGMEMOD model regarding changes in the production volume and output prices enter the EAA/ABTA model as input variables. The paper presents the main economic indicators of Slovenian agriculture (volume of production, producer prices, prices of intermediate consumption, subsidies on products, subsidies on production, gross value added, net value added at producer and basic price, factor income) in the period 2000-2005 and the forecasts up to 2013. Special attention in the analysis of results is devoted to a discussion on the advantages of combining the two models for the outlook simulations.

METHODOLOGY

ABTA is defined as an economic account for agriculture disaggregated to the level of individual activities, where activity means a production of individual product or individual main product and related parallel or by-products (Henrichsmeyer, 1988). ABTA thus provides the same information at the level of activities as the EAA provides at the level of a sector (Wolf, 1988). As such EAA/ABTA system may also be used as a tool for ex-ante analyses. The quantitatively expressed input/output relations are defined by the so-called MAC coefficients (*Matrix of Activity Coefficients*) calculated directly from ABTA. Models based on MAC matrix explain well the changes in income if changes in prices and production volume, which are exogenous variables, are available.

Economic indicators of Slovenian agriculture are prepared and analysed using EAA/ABTA data for the period 2000-2006. The concept of the preparation of ABTA is based on the principle that the sum of individual activities equals the values of EAA. This applies both to the individual output items as well as to the input items. Net EAA concept was used, where feeding stuffs produced and consumed by the agricultural holdings are not included in the accounts as separate item. Inputs used for its production as well as subsidies linked to fodder crops are allocated to the individual livestock activity according to the relevant fodder balance sheets.

For the estimation of economic indicators in the period 2007-2013 EAA/ABTA model was used taking into account MAC coefficients calculated from ABTA for the period 2000-2005. EAA/ABTA model is relatively simple. Basic calculation can be illustrated by following formulas:

$$V_i^{n+j} = AC_i^n * Qo^{n+j} * p_i^{n+j} \quad ; \quad AC_i^n = \frac{Qi_i^n}{Qo^n}$$

V = estimated value of parameter; AC = activity coefficient; Qo = volume of activity output

P = producer price; Qi = volume of input;

i = input item (energy, feedingstuff…); n = reference year; j = forecast year

Changes of production (land use, animal number, and production volume) and output prices used in the EAA/ABTA model are taken from AGMEMOD partial equilibrium commodity model for Slovenia (Erjavec, van Leeuven, Regoršek, 2007). As a multi-product modelling system, this model is well suited to reflect the supply and demand interrelationships among agricultural products (as exemplified by the beef and grains/feed relationship). Behavioural relationships reflecting supply and demand responses can be built in. Another attraction of this model type is the flexibility it offers to incorporate exogenous variables such as technical progress, population growth, income and consumer preference trends. (For a detailed description of the structure of the models see Erjavec, Donnelan, Kavčič, 2006).

So far AGMEMOD model includes only 7 agricultural commodities (wheat, maize, beef, pigmeat, poultrymeat, sheep and goatmeat, milk). For activities not included in AGMEMOD, the estimates of changes of production and prices were prepared separately using trends and expert estimations. Furthermore, AGMEMOD does not provide estimates about changes of input prices which are needed in EAA/ABTA model. Therefore price changes of individual basic group of inputs were also estimated separately on the basis of available outlooks (f.i. EIA, 2007) and past trends. Changes of output and input parameters included in EAA/ABTA model are shown in table 1.

Additional problem, which required special attention in the simulation for the period 2007-2013, occurred due to changes in subsidies brought about by the CAP reform of direct payments. In Slovenia, the reform was introduced in 2007 as a combination of the regional and historic payments (hybrid model) along with only some production coupled payments (65% of the special beef premium, 50% of the sheep and goats premiums, 25% of the hop premium and support for extensive rearing of cows and heifers for meat). With the reform the majority of direct payments in the EAA framework thus became a part of subsidies on production, which are not directly linked to individual product or activity. This means that in ABTA these payments need to be allocated to activities using keys i.e. in the same way as compensatory allowances in the framework of rural development policy (LFA and agro-environmental payments).

Table 1 Changes in output and input parameters up to 2013 (2005=100)

| OUTPUT parameters				INPUT parameters	
Activity	Area/ Animal number	Production volume	Producer prices	Item	Prices
Wheat	119	137	101	Seeds	115
Grain maize	109	113	110	Energy	90
Barley	108	109	119	Fertilizers	87
Beef	82	80	106	Pesticides	110
Pigmeat	97	94	96	Veterinary expenses	113
Poultry meat	97	95	97	Feeding stuffs	108
Sheep & goat meat	153	155	109	Maintenance of materials	120
Milk	78	95	97	Maintenance of buildings	131
Industrial crops	120	130	112	Agricultural services	127
Fruit	89	126	107	Other goods and services	120
Vegetable	122	96	107	Investment goods	120
Grapes and wine	93	107	104		
Others	100	100	100		

As on aggregate subsidies represent an important share of agricultural income, the decision regarding the way of allocation of subsidies on production may have important (or even crucial) influence on economic results on the level of individual activity. Despite the fact that historical entitlements are by definition production decoupled payments, at the beginning of implementation of the reform the beneficiaries of these payments will be only producers of corresponding products. Therefore, in the first year (2007) historical payments (100% of sugar payments, 80% of dairy premiums, and 30% of all premiums for the beef sector) are allocated directly to relevant activity (in the same way as subsidies on products). As from 2008, some changes in production structure are presumed and therefore increasing part of these payments is treated as totally decoupled and allocated to the individual products using agricultural land use structure as a primary key and fodder balance sheets as secondary key (for allocation of fodder subsidies to the livestock activities). The same keys are used also for allocation of other subsidies on production (basic flat rate payments per hectare, compensatory allowances in the frame of RDP).

RESULTS AND DISCUSSION

Model results forecast a relatively favourable economic situation for Slovenian agriculture on the aggregate level in the next years (Graph 1). Main economic

parameters influencing agricultural income are expected to be stable. Quite intensive downward trend of agricultural producer prices and upward trend of input prices from recent period are expected to slow down. Subsidies will be on slightly higher level due to implementation of the reform model of direct payments while production is not expected to change much.

Behind the stable condition at the aggregate level, relatively dramatic changes in economic results can be expected on the level of individual activity. Simulation results in Table 2 show that for some activities (sheep and goats, milk) the income is expected to increase significantly while for some others (pigmeat, poultry meat) sharp downward trend is forecasted.
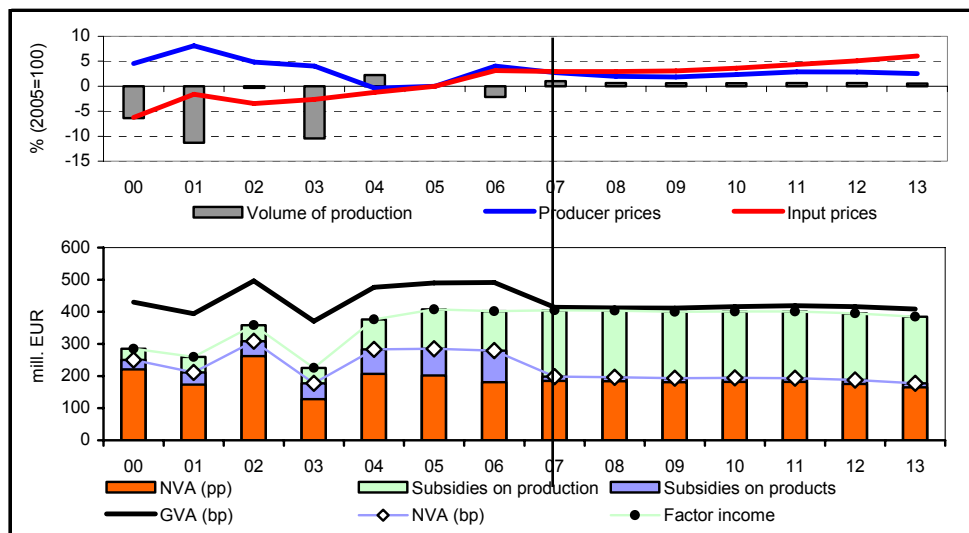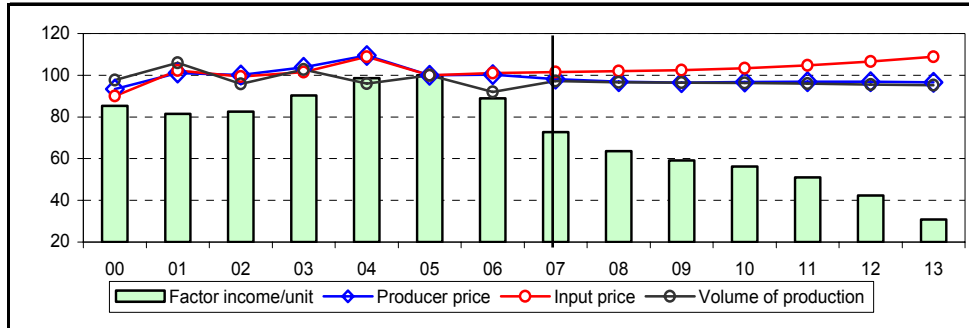

Graph 1 Main economic indicators for Slovenian agriculture; 2000-2013

In general, one can say that the direction of income changes on the level of individual activity is more or less consistent with the production and price outlooks. However, the intensity of these changes for some activities could raise questions about reliability of results. More detailed analyses by activities reviled that the problem could be largely attributed to a different treatment of some relevant parameters, like input prices and subsidies in AGMEMOD and ABTA/EAA model used as a tool for simulation. The problem of inputs is illustrated in Graph 2 on the example of poultry meat.

Table 2 Changes in income by activity up to 2013 (2005=100)

	Output volume	Producer Price	Basic price	Total value							Per unit value	
				Output		Intermediate consumption	GVA	NVA	Sub-sidies	Factor income	Factor income	Sub-sidies
				PP	BP							
Wheat	137	101	64	139	87	142	-34	-183	99	76	55	72
Barley	113	110	65	123	73	122	-159	-	108	82	73	95
Grain maize	109	119	85	129	93	129	6	-106	99	74	68	91
Beef (cattle)	80	106	88	85	70	95	44	-132	88	78	98	110
Pigmeat	94	96	96	91	91	93	61	8	119	19	20	127
Poultry meat	95	97	98	93	93	106	46	26	69	29	31	72
Sheep & goats	155	109	102	168	158	179	151	144	152	157	101	98
Milk (dairy cows)	95	97	89	92	84	96	78	57	138	108	113	145
AGMEMOD, total	95	100	89	96	84	101	59	5	106	86	90	111
Other activities	108	105	104	114	113	123	108	99	114	103	95	105
Agriculture, total	**101**	**103**	**95**	**103**	**95**	**106**	**84**	**62**	**107**	**94**	**94**	**106**

Graph 2 Main economic indicators for poultry meat; 2000-2013 (index 2005=100)

The actual data (2000-2006) show that generally changes of prices of poltry meat went along with changes of the prices of inputs (especially feed prices) and as a result the production volume and the income were relatively stable. After 2006, according to AGMEMOD outlook the poultry meat production is expected to decrease slightly as a result of downward trend in output price. However, if along with that outlook expected increase of input prices are taken into account, the income per unit would drop so significantly that one can expect more radical change (drop) in output despite relatively small changes in output price.

Another problem is related to the treatment of subsidies in the models. Graf 1 shows that subsidies form an important part of agricultural income. Furthermore, they have an important impact on production regardless of whether they are classified as subsidies on product (production coupled payments) or as subsidies on production (decoupled direct payments and other compensatory allowances). With the reform of direct payments the problem of subsidy allocation is becoming even greater. Practically all subsidies gain the characteristics of subsidies on production i.e. subsidies which in line with some theories should not be included in sector models on the level of individual products. If such an approach is taken into account, sector analyses become problematic. The problem is clearly illustrated by model results for wheat in Graph 3. In the case of wheat, the producer price (without any subsidies) does not cover even for direct production costs (intermediate consumption). According to economic criteria, such conditions should lead to immediate cassation of production. If production exists, this is due to subsidies, which in case of wheat crucially influence the income level.
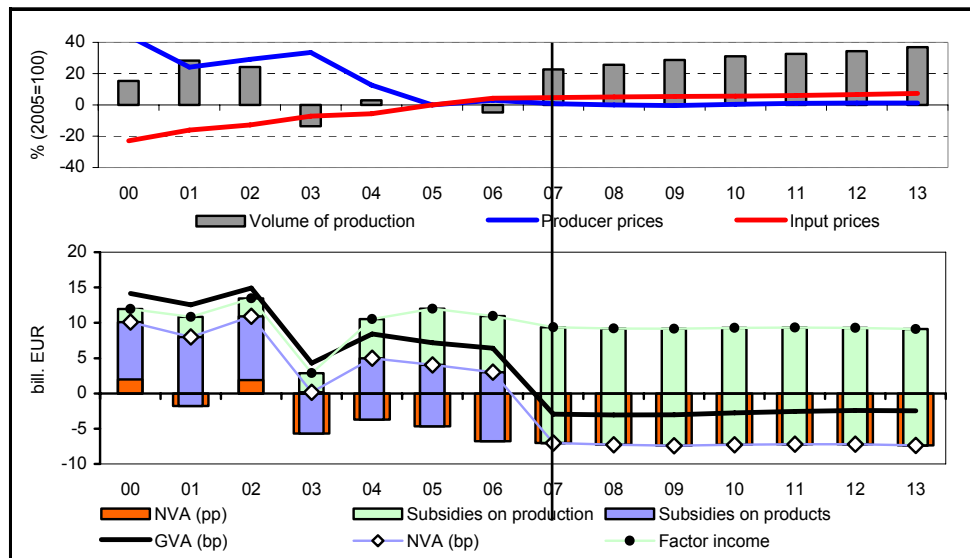
Graph 3 Main economic indicators for wheat; 2000-2013

The problem of treatment of subsidies is shown also in model results for cattle (milk and beef) production. Even if a drop in milk production along with a rise in income can be explained by production quotas limitations, it is more difficult to explain a drop in beef production in the situation of relatively favourable income indicators. The explanation for such development could be again the method how both models incorporate decoupling payments. While on the one hand the factor income incorporates all payments, i.e. CAP payments from the 1st and 2nd pillar in their total amount, the AGMEMOD model on the other hand in the factors affecting production incorporates only a part of the 1st pillar payments with coupled effects.

CONCLUSION

Theoretically consistent and practically applied empirical tools for economic analyses are a basis for efficient decision making in agricultural policy. This is especially valid for the acceding countries to EU where the economic and institutional frame for agricultural production is changing significantly and impact analysis can be an important element of accession negotiations. EAA models could fulfil the expectation of decision makers for relevant short term analysis or static impact analysis. For long term analysis, equilibrium models could improve the frame of analysis.

In this paper a combination of both tools is presented. Model results forecast relatively favourable economic situation for Slovenian agriculture on the aggregate level in the next years. Main economic parameters influencing agricultural income are expected to be stable. Subsidies will be on slightly higher level while production is not expected to change much. Unlike the results at the aggregate level, the results at the level of individual products reveal a possibility of greater, even dramatic changes in income.

A more detailed analysis of results has pointed to certain inconsistencies which diminish the credibility of the results. But at the same time it became clear that the possibility of a good logical control of the results could be the greatest advantage of the applied method. By applying this method, one could identify methodological as well as substantive inconsistencies of both methods, which however could be crucial for further improvements of the work. In the process of accession to the European Union, the development of empirical modelling tools becomes an important task. The validation of different approaches and modelling tools could improve their reliability and use. Such approach can point out the weaknesses of both models and improve the practical relevance of the modelling exercise. For the moment, the main problem of EAA/ABTA model is its static approach and limited possibilities to take into account the technological progress, while the problems of AGMEMOD partial equilibrium model are found in ignoring input price changes and maybe theoretically correct, but practically not relevant treatment of subsidies.

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