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AGRICULTURAL POLICY ANALYSIS MODEL FOR SLOVENIAN AGRICULTURE

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ABSTRACT

The ability to present a coherent and internally consistent position for negotiation depends upon the ability to generate and analyse the consequences of alternative future policy scenarios for the agricultural sector. This paper develops a model to provide economic information that can be used to make policy decisions. In this current period aiming towards a market-oriented economy and the accession to the EU, the Slovenian government will be undertaking various policy measures that will have significant impacts on all spheres of the economy, particularly on the agro-industry. The purpose of this paper is to develop a model that can be used to evaluate a range of changes in agricultural policies, macroeconomic policies, and structural changes. The model used for analysing policy options for Slovenian agriculture (APAM) is in fact a combination of models, a partial equilibrium, multi-commodity supply and demand model (APAS) and a policy analysis matrix (PAM). This innovative combination and interaction between these models was established in order to increase the flow of information through the analysis and estimation of a number of important indicators (Income, DRC, EPC, etc.). A static model like PAM may generate results that are not realistic in a dynamic sense and potentially biased against government policies. To overcome this limitation a connection was established between PAM and APAS to identify likely changes of private profitability in mid term, i.e. if Slovenia would adapt its agricultural policy to reformed CAP as well as for various policy scenarios.

KEYWORDS:
AGRICULTURAL POLICY, PRICE POLICY, TRADE POLICY, SIMULATION, SLOVENIA

1. INTRODUCTION

National agricultural policy objectives and means are constrained by the various policy settings and limits exist as to the selection of objectives and means by policy makers. While certain things can be negotiated, the ability to present a coherent and internally consistent position for negotiation depends on the ability to generate and analyse the consequences of alternative future policy scenarios for the agricultural sector. This paper develops a model to provide economic information that can be used to make policy decisions. The analysis provides results that will be useful in guiding policy decisions and more detailed policy research. In this current period toward a market-oriented economy and the accession to the EU, the Slovenian government will be undertaking various policy measures that will have significant impacts on all spheres of the economy, particularly the agro-industry. The purpose of this study is to develop a model that can be used to evaluate a range of changes in agricultural policies, macroeconomic policies, and structural changes. This model provides a flexible and efficient policy analysis tool that can be used to test alternative specifications and parameters and to evaluate the sensitivity of impact analysis to varying assumptions.

The choice of variables, assumptions, and relationships differentiates the models. Two broad frameworks have been adopted in the process of sector modelling; the partial equilibrium and the general equilibrium approaches. Partial equilibrium denotes those methods that are more sector specific in nature and which examine particular sectors or commodities in the economy while generally ignoring interrelationships with other sectors of the macro economy. General equilibrium models, by contrast, examine the economy as a whole and the interactions between sectors. These models tend to include a number of important determinants of the macro economy such as savings, employment and income. While the general equilibrium approach is intuitively more appealing and in principle permits a full specification of both income and efficiency effects, its limitations, not minimal in terms of the modelling effect and resources required, make it a complement, but not a substitute for the partial equilibrium approach (Goldin and Knudsen, 1990).

This paper uses a synthetic-type, multi-market, partial equilibrium model (the model is not a general equilibrium model in that markets for other tradable goods, services and financial factors of production are excluded, so, currency exchange rates have to enter as exogenous variables) together with a policy analysis matrix (PAM) to explore agricultural price and trade policy options in Slovenia.

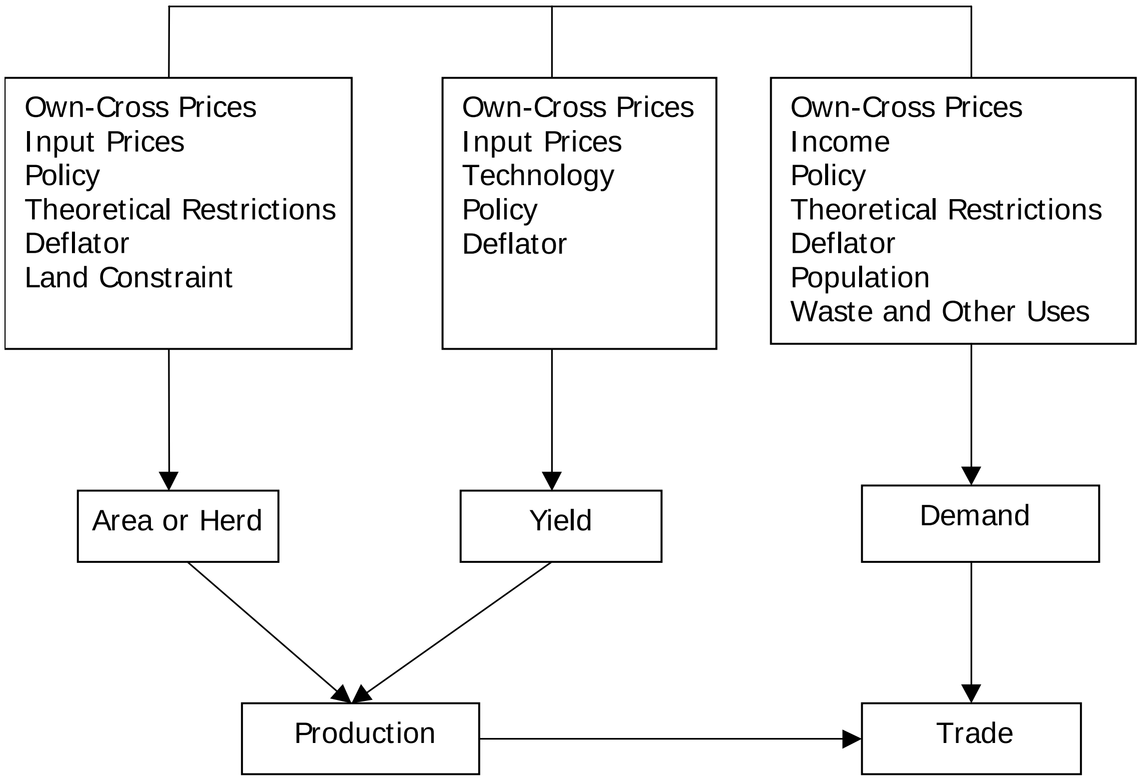
2. AGRICULTURAL POLICY ANALYSIS SIMULATOR

An agricultural policy analysis simulation model (APAS) together with a policy analysis matrix (PAM) are used in this study. The APAS is designed as a representation of the econometric multicommodity models. This model is a modification of an earlier one developed by Mergos, 1988, Stoforos, 1997 and Mergos et al. 1999. It takes into account the specific features of the Slovenian agro-industry and recent policy changes. The advantage of a multi-market model in analysing agricultural price and trade policies is that it can accommodate a large number of products (livestock, food crop, industrial crop, feed crop and tree crop products) that represent the largest part of Slovenia's total agricultural production. Such simulation models have been used in the past for simulating agricultural price changes in economies in transition (Kazauskiene et al., 1991) but also for market economies (see Thomson, 1991, and Roningen et al. 1991).

The model is called APAS, which stands for Agricultural Policy Analysis Simulator. The name is chosen because it precisely describes the contents and use of the model. The APAS model is a partial equilibrium, dynamic, multi-market, synthetic and policy oriented simulation model:

a) **Multi-product**: The model framework can build multi-product,
b) **Partial equilibrium**: The model normally examines relationships within the agricultural sector and not resource shifts between sectors. Factor prices and other general equilibrium conditions are assumed to be fixed although, some macro elements enter the model in the form of various policy scenarios,
c) **Synthetic**: Model parameters are not estimated with APAS framework. Rather, they are obtained from the literature or can be econometric estimates,
d) **Policy-oriented**: The model is designed to analyse the economic implications of policy changes that can have an important impact.

Figure 1. APAS Model Structure



The logic of the model structure is presented in Figure 1. In this structure, two major exogenous forces determine prices: the world market and/or the government. These prices, in turn, determine the demand and supply of agricultural products. Trade is the equilibrating mechanism for balancing demand and supply of commodities given a certain set of prices. Depending on the size and efficiency of the market in question, a country's domestic price is generally only a few percentage points above the border price for imports, and a few percentage points below the border price of exports. The existence, however, of government price and trade policies with taxes and subsidies on imports and/or exports can drastically change the domestic-world market price spread.

The core of the model consists of a set of elasticity matrices, a matrix of demand elasticities and a matrix of supply elasticities. The model explicitly recognises the relationship between quantities demanded or supplied to changes in prices. In fact, consumer and producer responses to price changes are quantified in terms of own and cross price elasticities. The demand function is written: ln (QD)= W+ B*ln(P)+ C*ln(I) where, QD= the vector of commodity demanded for each commodity, W: the vector of the constant parameters for each equation, B= the symmetric matrix of demand elasticities, P= the vector of retail price for each commodity, C: the vector of income elasticities of demand, I= is income. Total output (Q) is given by the product of land (L) and yield (Y). Thus, we have lnQP = lnL + lnY, where, QP= vector of quantities produced, L: vector of land, Y= vector of yield. The functions for land (L) and yield (Y) are:

$$\ln L_i = A + \varepsilon_{ii} \ln P_{it,t-1} + \sum \varepsilon_{ij} \ln P_{jt,t-1} + \ln Z_a + \ln L_{it-1} \quad \mathbf{1}$$

where (1) is in logarithmic form, P is the vector of prices and ZA are other variables (i.e.

trend, etc.).

$$\ln Y_i = A + \varepsilon_{ii} \ln P_{it,t-1} + \sum \varepsilon_{ij} \ln P_{jt,t-1} + \ln Z_a + \ln Y_{it-1} \qquad \mathbf{2}$$

where (2) is also in logarithmic form and ZB are other shift variables.

The model simulates the impact of changes in a set of exogenous variables and government policies on a set of endogenous variables. The model starts from a base year 1997 (the latest year for which data are available) and then projects the changes that result from the implementation of various scenarios.

Every model used for policy analysis and advice needs to possess a credibility of results. The credibility of a model is tested every time the model is used for policy analysis by ensuring some calibration of the model for the base year. This is done by adjusting the constant terms in a set of supply and demand equations. However, before the model can be used in policy analysis, several steps of testing are required.

The logical structure of the model needs to be checked for internal consistency and conceptual validity. The next aspect is to check the model's predictive ability in a real world situation. This testing is done by running the model against situations with time-series data that are available. APAS model was tested using historic simulation. Nineteen ninety six (1996) was used as the base year and the model was tested for 1996, 1995 and 1994. The results were proved to be very promising with a variation of at most 8%.

3.POLICY ANALYSIS MATRIX AND ITS LINK TO APAS

As it was previously pointed out, APAS is used in this paper along with a policy analysis matrix (PAM). The PAM model has been selected as a basic technique for analysing income, protection and competitive issues of different policy options. The reason underlying this decision is in its relative simplicity, data availability and straightforward procedure of calculations. The basic PAM methodology has been developed in USA (Monke et al., 1989) and widely used in many developing countries (Goldman et al., 1991; Harrigan et al., 1992; Kydd et al., 1997; Nelson and Panggabean, 1991; Scarborough and Kydd, 1992; Pearson et al., 1995; Yao, 1997a) It has also been used for estimation of likely consequences of full membership of Portugal in EU on its agriculture (Pearson et al., 1987) and more recently for the same purpose in Estonia (Yao, 1997b) and Slovak Republic (Michalek, 1995).

The policy analysis matrix (PAM) provides a systematic framework for assessing the impacts of government's intervention in certain production systems. According to Monke and Person (1989) the structure of PAM can be described as a product of two accounting identities: one defining profit as the difference between revenues and costs and the other measuring the effects of divergence (distorting policies and market failures) as the difference between observed parameters and parameters that would exist if the divergences were removed. By completing a PAM for a production system one can simultaneously determine the existing economic efficiency of the system, the degree of distortion on the input/output markets, and the extent to which resources are transferred among agents.

The two distinct characteristics of PAM are the classification or disaggregation of the costs of inputs into their tradable and non-tradable components and the valuation of revenues, costs and benefits using both market (private) and efficiency (social, shadow or economic) prices. Tradable inputs include those inputs that can be traded in the world market (fertilisers, seeds, pesticides). The non-tradable inputs are mainly domestic factors which are not traded internationally (land, labour, local capital). Most inputs, however, come in as a mixture of some tradable and non-tradable components and must be disaggregated into their respective tradable and non-tradable components. A summary of the PAM approach is given in Table 1.

Table 1. Structure of PAM

	Revenues	Tradable input costs	Domestic resource costs	Profits
Private values	A	B	C	D
Social values	E	F	G	H
Divergence	I	J	K	L

Private profit, D = (A - B - C); Social profit, H = E - F - G; Output transfers, I = A - E; Tradable input transfers, J = B - F, Non-tradable input transfers, K = C - G; Net transfer, L = D - H = I - J – K.

Source: Monke and Pearson (1989).

The valuation of revenues, costs and profits by their private and social prices allows PAM to determine the extent of divergences caused by policy intervention and/or market failure in both the input and output markets. In this context the private prices are simply the open market prices and the social prices are the shadow prices of all the inputs and outputs of the concerned production system. For tradable goods their shadow prices are the parity prices, (export or import) evaluated with world price (c.i.f. or f.o.b.) at the point of utilisation. The same principle applies to output. For non-tradable factors their shadow prices are the values of output forgone of their best alternative use, i.e. the opportunity costs of the factors.

Private profit is defined as the difference between the value of output produced ($p_o{*}q_o{*}$) and of inputs used ($p_i{*}q_i{*}$) valued at vectors of market (private) prices as follows:

$$\Pi_o^* = p_o^* q_o^* - p_i^* q_i^* \qquad \textbf{3}$$

In the same way economic or social profitability can be defined as the difference between value of outputs produced (poqo) and of inputs used (piqi) priced according to their social opportunity. The equation is as follows:

$$\Pi_o = p_o q_o - p_i q_i \qquad \textbf{4}$$

Private profit measures the private profitability faced by the producer for the production of a certain product. Social profit is a measure of social profitability. Because private and social prices may be (and in most cases are) different, social profitability does not coincide with private profitability. A crop, which is socially profitable, can be unprofitable to the private producer if the private price offered is lower because of taxation in the production process. Similarly, a certain crop, which is privately profitable to the producer, can involve a net loss to the society if its production is subsidised.

Output transfer measures the divergence between the private and social revenue, therefore, it reflects the extent to which the product market is distorted by government policy. Tradable input transfer and non-tradable input transfer are divergences between the private and social values of inputs and so measure the transfer (taxation or subsidy) from the producers to the society for their purchase. Net transfer measures the extent of distortion in profitability. It reflects the net effects of distortions occurring in both the input and output markets.

All measures previously described, provide important information on the extent of profitability and distortions faced by production systems, but being absolute figures they cannot be used for comparisons among different systems of production or across countries. To overcome this problem, PAM provides a set of relative indicators like well-known nominal protection coefficient on outputs (NPC), the effective protection coefficient (EPC) and the domestic resource cost ratio (DRC).

$$NPC = \frac{p_o^*}{p_o} \qquad EPC = \frac{p_o^* q_o^* - p_t^* q_t^*}{p_o q_o - p_t q_t} \tag{5}$$

NPC is defined as the ratio of domestic market price to the border parity price of a commodity. In the PAM framework, this is equal to the ratio of private revenue to social revenue. It is a summary indicator of all government's intervention preventing equality between domestic price and border parity price of a commodity. NPC > 1 implicitly indicates subsidy of domestic production. NPC considers distortion of government policy in product market. EPC as ratio of value-added measured at private prices to value-added at social prices, measures the total effects of intervention in both markets. If EPC >1, it implies that overall impact of the existing policy results in a net positive incentive to produce the commodity.

$$DRC = \frac{p_n q_n}{p_o q_o - p_t q_t} = 1 - \frac{NSP}{p_o q_o - p_t q_t} \tag{6}$$

$$NSP = p_o q_o - p_t q_t - p_n q_n$$

where DRC is the ratio of domestic factor cost required to produce a certain amount of output valued at social prices to the value-added created by the same resources at social prices. Therefore, it is a social cost-benefit ratio, which helps determine the desirability of certain domestic production system relative to the international market in terms of economic efficiency. The domestic factor cost is the opportunity cost of domestic resources involved in the production of commodity and the benefit is the value-added generated by the resources measured at social prices. If the cost is greater than benefit, production of commodity is not desirable from the social point of view. At DRC < 1 the domestic factor cost is less than the social benefit generated by resources involved, what implies that it is socially desirable to expand the production of the concerned commodity (Yao, 1997a). Assuming no distortion in the world market it also implies comparative advantage of the country in producing the commodity. DRC > 1 implies that the country is not internationally competitive in the production of the commodity, since the opportunity cost of the domestic factors involved in the production of the concerned commodity is greater than the social value-added generated by those factors. As an important indicator of comparative advantage, DRC can be used to rank the competitiveness of different commodities.

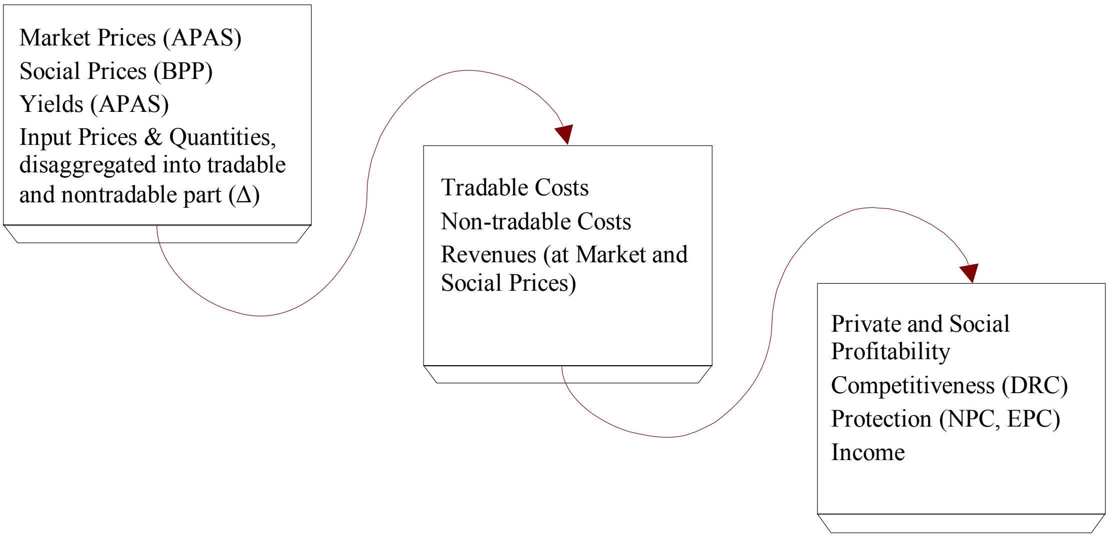
Income was also estimated for each activity using PAM framework,

$$NI_i = VP_i - IC_i + Sb_i - Tx_i - Dp_i - Rn_i - Int - Wg \tag{7}$$

where, NI: net income, VP: value of (crop or livestock) production, IC: intermediate consumption, Sb: subsidies, Tx: taxes, Dp: depreciation, Rn: rents, Int: interests, Wg: wages of hired labour.

Net income was calculated per hectare of land for crop production and per head for livestock production as well as at the aggregate level, applying size of production (acreage or number of animals) previously calculated by APAS. The same holds for yields, which are incorporated to PAM from APAS projections and results obtained were applied in the PAM analysis for both the revenue and the input (cost) side. Improvements in yields are a consequence of technological changes implying different input levels, which were calculated using linear regression procedure (assuming marginal costs of different cost items to be constant on a range of yields' changes). PAM procedure, followed in this study, is summarised in figure 2 below:

Figure 2. PAM Model Structure



A static model like PAM may generate results that are not realistic in a dynamic sense and potentially biased against government policies. To overcome this limitation a connection was established between PAM and APAS to identify likely changes of private profitability in mid term, i.e. if Slovenia would adapt its agricultural policy to reformed CAP (EC, 1998) as well as for various policy scenarios. For this reason all parameters already mentioned have been calculated for a base year (1997) as well as for years 2000, 2003, 2006 and 2010.

Most data for this study are obtained from the Agricultural Institute of Slovenia (Volk et al.) and the Statistical Office of Republic of Slovenia. Calculations for above average intensive production have been adjusted to average intensity applying the same procedure as for yields' changes during the period under investigation. Original PAM analysis assumes fixed input-output coefficients to determine the relative economic efficiency and uses fixed levels of macroeconomic variables (e.g. exchange rate). This implies that PAM results are for the base year and cannot be used to recalculate the new quantities of output and inputs that would result from general equilibrium effects due to changes in social opportunity costs or change in other variables. Another limitation is that PAM does not link different activities endogenously and implies that changes in the profitability of one farm activity will not alter the input-output relationship in other activities or even the level of inputs into other activities. Such general equilibrium effects are not captured by PAM directly because PAM does not include elasticity estimates (Khan, 1997). Part of these limitations can be minimised by relaxing assumptions that are made to estimate some key parameters. Usually this is conducted by sensitivity analysis to assess the robustness of PAM results to changes in parameter assumptions. In our study another approach has been selected: linkages with a partial equilibrium model (APAS) that incorporates elasticity estimates – such an approach gave the possibility to estimate impacts of changes, projected in the next decade.

4. AGRICULTURAL POLICY ANALYSIS MODEL FOR SLOVENIAN AGRICULTURE

The models (APAS and PAM) described above are implemented for the agricultural sector of Slovenia. As it was pointed out, the core of the APAS model are the elasticity matrices. The solution adopted for the determination of the functional form of the equations used in the model was the calibration of the model using elasticities from previous estimations for Slovenian agriculture (Erjavec et al., 1996a, Erjavec et al,. 1996b, Gardiner et al., 1989) which used single equation supply functions (the same occurred for the demand elasticities) with the imposition of homogeneity using the strong separability assumption. The model is disaggregated in three main product categories: annual crops: wheat (WHE), maize (MAI), potatoes (POT) and sugar beet (SGB), tree crops: grapes (GRP) and apples (APL) and livestock products: cattle meat (CMT), pig meat (PMT), poultry meat (LMT), cow milk (CML). In this form of the model there are 4 equations for each product: (i) land used or total number of animals; (ii) yield; (iii) total supply (this is based on an identity i.e. (i)*(ii)) and (iv) demand. The disequilibrium between domestic supply and demand is cleared by net trade. It is important to state that maize is used as a main feed component in the livestock equations and at the same time livestock products (except poultry) are used in the maize equation as main determinants for feed demand. Finally there is a fifth equation introduced for grassland.

The general form of the area equations used in the model is:

$$\sum_{i=1}^{n} L_i = \sum_{i=1}^{n} A_i + \sum_{n=1}^{k} \varepsilon_{n*n} * \left(\sum_{i=1}^{n} \ln P_i - \ln P_c \right) + \sum_{i=1}^{n} B_i * \sum_{j=1}^{m} \ln L_{j_{t-1}} \qquad \textbf{8}$$

where = is the cultivated area (or the number of animals), ’s= are the own, the cross price and the input prices,   = is the consumption deflator, = the lagged dependent variable, B=the long run effect and ε = the corresponding elasticities. It is important to point out that the area equations are solved simultaneously under the restriction of total land availability (200 thousand HA),

$$\sum_{i=1}^{n} L_i \leq TLA = 200th.HA \qquad \textbf{9}$$

where TLA stands for total land availabilty.

The elasticities used in the model are shown in the Appendix (Table A). Elasticities for area equations range between -0.01 to 0.32. For trees, relative price elasticities are 0.14 for grapes and 0.17 for apples. In relation to the real price of inputs the elasticity of supply used ranges between -0.06 and -0.37. For livestock products the own price elasticity range between 0.26 for cow milk to 0.43 for pig meat.

The general form of the yield equation used in the model is:

$$\sum_{i=1}^{n} Y_i = \sum_{i=1}^{n} C_i + \sum_{n=1}^{k} \varepsilon_{n*n} * \left(\sum_{i=1}^{n} \ln P_i - \ln P_c \right) + \sum_{i=1}^{n} \Gamma_i * \sum_{j=1}^{m} \ln Y_{j_{t-1}} \qquad \textbf{10}$$

where = is the yield, =is the lagged yield, and Γ = is a coefficient that corresponds to technological changes. Zeros have been entered for most of the yield elasticities since in Slovenia, yield is not very responsive to changes in price and it can be considered as a technology driven variable (the structure of production in Slovenian agriculture restricts the form and the value of yield elasticity). For purposes of policy analysis and for getting information related only to price changes, the same policy scenarios were run with and without technological changes. In Table B in the appendix the yield elasticity used in this model are presented.

Own price, cross price and income are the main explanatory variables in demand equations. The general form of the demand equations is as follows:

$$\sum_{i=1}^{n} D_i = \sum_{i=1}^{n} C_i + \sum_{n=1}^{k} \varepsilon_{n*n} * \left(\sum_{i=1}^{n} \ln P_i - \ln P_c \right) + \sum_{i=1}^{n} \Gamma_i * \ln I_i \qquad \textbf{11}$$

where is demand of the product i, is the corresponding price and the cross price and I the income. Income elasticity, shown in Table C of the Appendix, range between 0.06 for potatoes to 0.32 for apples (the demand elasticity are for the long run so the lagged coefficient of demand is zero).

The production decisions of farmers in Slovenia depend on the real net price received relative to their costs of production. The real net output price received by farmers depends on the world market price, tariff and non-tariff barriers to trade, the real exchange rate, product and trade taxes, marketing costs and the rate of inflation as measured by the consumer price index. The costs of production depend, among other factors, on the prices of input factors and government subsidies. As a result, the first step in proceeding with policy analysis is the estimation of the level of protection with the calculation of producer-subsidy-equivalents (PSEs) for the traded agricultural products. Next, one has to choose the time path for the abolition of protectionism measures in the case of the full liberalization scenario.

As it was previously pointed out, prices are considered exogenous to the system of equations. In order to determine model prices used for policy analysis and projections, a transmission equation was used, so that world prices could enter the domestic market adjusted according to the implementation of various border policies (taxes or subsidies).

$$MP_i = (BP_i * XR)/(BP_i / XP_i) \qquad \textbf{12}$$

$$BP_i = VaX_i / VoX_i \text{ or } BP_i = VaI_i / VoI_i \qquad \textbf{12a}$$

$$XP_i = DP_i * XR \qquad \textbf{12b}$$

$$DP_i = \Pr P_i + \left(\hat{A_i} * \Pi_i \right) \qquad \textbf{12c}$$

where, MP is the price used in the APAS and by its linkage to PAM model for policy analysis and forecasting, BP is the border price determined by value and volume (Va and Vo) of exports (X) for the exported products and of imports (I) for the imported products, XR is the dollar or ECU (depending on the policy scenario under consideration) exchange rate, XP is the domestic price expressed in foreign currency, DP is the domestic price expressed in SIT (Slovenian currency), PrP is the producer price, A is a policy multiplier and Π is the policy affecting farmer's decision making.

Equation 12c introduces the various domestic or EU policies like compensation payments for cereals, animal premiums or policies that can be quantified and assumed to affect producer's decisions for increasing or decreasing their production. The basic assumption of this model is that through a multiplier effect (A) policies are introduced into the price system (Stoforos et al. 1997, Froheberg, 1999) and determine the production and consumption levels. Other policies, like quantity or land restrictions (i.e. sugar, milk) are introduced via the maximization process where the quota level is computed as the restriction to the output maximization problem (quota levels are determined in different levels among the various scenarios). Through APAS projections for yield, land (or herd) and output for every product under consideration, it is possible to incorporate all relevant information to the PAM model so as to get valuable information for protection, competitiveness and income for all policy scenarios.

5. CONCLUSIONS

The main aim of this paper was the development of an agricultural sector model for the analysis and determination of policy options for Slovenian agriculture. In order to establish a flow of information that will include a number of important indicators (i.e. supply, demand, trade, DRC, income, welfare, etc.) two models were used: a partial equilibrium, multi-commodity, supply and demand model (APAS) and a policy analysis matrix. A static model like PAM may generate results that are not realistic in a dynamic sense and potentially biased against government policies. To overcome this limitation a connection was established between PAM and APAS to identify likely changes of private profitability in mid term. Calculations for average intensive production have been adjusted to average intensity applying the same procedure as for yields' changes during the period under investigation. PAM does not link different activities endogenously and implies that changes in the profitability of one farm activity will not alter the input-output relationship in other activities or even the level of inputs into other activities. Such general equilibrium effects are not captured by PAM directly because PAM does not include elasticity estimates. Part of these limitations can be minimised by relaxing assumptions that are made to estimate some key parameters. Usually this is conducted by sensitivity analysis to assess the robustness of PAM results to changes in parameter assumptions. In this paper another approach has been selected: linkages with a partial equilibrium model (APAS) that incorporates elasticity estimates. Such an approach gave the possibility to estimate impacts of changes, projected in the future.

An important problem of the used methodology and at the same time an area for future research is related to the assumptions for the projections of social prices. In the present model social prices projections were based on expert opinion and on linear functional forms. Another way of dealing with this problem is to develop a Computable General Equilibrium model and then project the social prices through it (link APAS and PAM with a CGE).

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I. APPENDIX

Table A. Elasticities of "Area or Herd Equations"

ANNUAL CROPS	WHE	MAI	POT	SGB	CMT	PMT	CML	FER
WHE	0,32	-0,14	-0,07	-0,05	0,00	0,00	0,00	-0,06
MAI	-0,10	0,30	-0,06	-0,04	0,05	0,10	0,02	-0,27
POT	0,00	0,00	0,31	-0,09	0,00	0,00	0,00	-0,22
SGB	-0,03	-0,04	-0,08	0,28	0,00	0,00	0,00	-0,13
GRL	-0,02	-0,07	0,00	-0,01	0,22	0,05	0,20	-0,37
TREES	GRP	APL						FER
GRP	0,14	0,00						-0,14
APL	0,00	0,17						-0,17
LIVESTOCK	CMT	PMT	LMT	CML		BAR	MAI	LAB
CMT	0,31	-0,09	0,00	0,12		-0,08	-0,12	-0,14
PMT	-0,08	0,43	0,00	-0,02		-0,10	-0,16	-0,07
LMT	0,00	0,00	0,40	0,00		-0,16	-0,18	-0,06
CML	-0,04	-0,03	0,00	0,26		-0,04	-0,05	-0,10

Note: a)WHE stands for wheat, MAI for maize (prices of maize and barley are used as input prices for livestock products), POT for potatoes, BAR for barley, SGB for sugar-beet, GRL for grassland, CMT for cattle meat, PMT for pig meat, LMT for poultry meat, CML for cow milk, GRP for grapes and APL for apples and b) FER stands for fertilisers and LAB for labour.

Table B. Elasticities for Yield Equations

ANNUAL CROPS	WHE	MAI	POT	SGB		FER
WHE	0,07	0,00	0,00	0,00		-0,07
MAI	0,00	0,11	0,00	0,00		-0,11
POT	0,00	0,00	0,14	0,00		-0,14
SGB	0,00	0,00	0,00	0,10		-0,10
TREES	GRP	APL				FER
GRP	-0,03	0,00				0,03
APL	0,00	-0,06				0,06
LIVESTOCK	CMT	PMT	LMT	CML	BAR	MAI
CMT	0,00	0,00	0,00	0,00	0,00	0,00
PMT	0,00	0,00	0,00	0,00	0,00	0,00
LMT	0,00	0,00	0,00	0,00	0,00	0,00
CML	0,00	0,00	0,00	0,11	-0,04	-0,07

Note: a),WHE stands for wheat, MAI for maize (prices of maize and barley are used as input prices for livestock products), POT for potatoes, BAR for barley, SGB for sugar-beet, CMT for cattle meat, PMT for pig meat, LMT for poultry meat, CML for cow milk, GRP for grapes and APL for apples and b) FER stands for fertilisers.

Table C. Elasticities of "Demand Equations"

ANNUAL CROPS	WHE	MAI	POT	SGB	CMT	PMT	CML	INC
WHE	-0,13	0,04	0,00	0,00	0,00	0,00	0,00	0,09
MAI	0,00	-0,34	0,00	0,00	0,10	0,04	0,01	0,19
POT	0,06	0,00	-0,12	0,00	0,00	0,00	0,00	0,06
SGB	0,03	0,00	0,00	-0,14	0,00	0,00	0,00	0,11
TREES	GRP	APL						INC
GRP	-0,08	0,00						0,08
APL	0,00	-0,32						0,32
LIVESTOCK	CMT	PMT	LMT	CML				INC
CMT	-0,38	0,09	0,06	0,00				0,23
PMT	0,07	-0,32	0,07	0,00				0,18
LMT	0,03	0,06	-0,26	0,00				0,17
CML	0,00	0,00	0,00	-0,22				0,22

Note: a) WHE stands for wheat, MAI for maize, POT for potatoes, SGB for sugar-beet, CMT for cattle meat, PMT for pig meat, LMT for poultry meat, CML for cow milk, GRP for grapes and APL for apples and b) INC stands for income.