CZECH ACADEMY OF AGRICULTURAL SCIENCES

AGRICULTURAL ECONOMICS

Zemědělská ekonomika

INSTITUTE OF AGRICULTURAL AND FOOD INFORMATION

1

VOLUME 47
PRAGUE 2000
ISSN 0139-570X

AGRICULTURAL ECONOMICS

An international journal published under the authority of the Ministry of Agriculture and under the direction of the Czech Academy of Agricultural Sciences

ZEMĚDĚLSKÁ EKONOMIKA

Mezinárodní vědecký časopis vydávaný z pověření Ministerstva zemědělství České republiky a pod gescí České akademie zemědělských věd

Aim and scope: The journal published original scientific papers dealing with agricultural subjects from the sphere of economics, management, informatics, ecology, social economy and sociology. Since 1993 the papers continually treat problems which were published in the journal Sociologie venkova a zemědělství until now. An extensive scope of subjects in fact covers the whole of agribusiness, that means economic relations of suppliers and producers of inputs for agriculture and food industry, problems from the aspects of social economy and rural sociology and finally the economics of the population nutrition. Articles are published in English, reviews and information also in English, Czech and Slovak.

Abstracts from the journal are comprised in the databases: Agris, CAB Abstracts, Czech Agricultural Bibliography, WLAS.

Periodicity: The journal is published monthly (12 issues per year). Volume 47 appearing in 2001.

Acceptance of manuscripts: Two copies of manuscript should be addressed to: Mgr. Alena Rottová, Institute of Agricultural and Food Information, Slezská 7, 120 56 Praha 2, Czech Republic, tel.: + 420 2 24 25 34 89, fax: + 420 2 22 51 39 38, e-mail: rott@uzpi.cz. The day the manuscript reaches the editor for the first time is given upon publication as the date of receipt.

Subscription information: Subscription may be ordered only by calendar year (January–December) and should be sent to: Institute of Agricultural and Food Information, Slezská 7, 120 56 Praha 2, Czech Republic. Subscription price for 2001 is 195 USD (Europe) and 214 USD (overseas).

Up to date information is available at address: **http://www.uzpi.cz**

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Abstrakty z časopisu jsou zahrnuty v těchto databázích: Agris, CAB Abstracts, Czech Agricultural Bibliography, WLAS.

Periodicita: Časopis vychází měsíčně (12× ročně), ročník 47 vychází v roce 2001.

Přijímání rukopisů: Rukopisy ve dvou kopiích je třeba zaslat na adresu redakce: Mgr. Alena Rottová, Ústav zemědělských a potravinářských informací, Slezská 7, 120 56 Praha 2, Česká republika, tel.: + 420 2 24 25 34 89, fax: + 420 2 22 51 39 38, e-mail: rott@uzpi.cz. Den doručení rukopisu do redakce je publikován jako datum přijetí k publikaci.

Informace o předplatném: Objednávky na předplatné jsou přijímány pouze na celý rok (leden–prosinec) a měly by být zaslány na adresu: Ústav zemědělských a potravinářských informací, vydavatelské oddělení, Slezská 7, 120 56 Praha 2. Cena předplatného pro rok 2001 je 816 Kč.

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Mathematical model AGRO-3 for simulations and predictions of agrarian policy impacts on the agrarian sector

Matematický model AGRO-3 pro simulace a predikce dopadu agrární politiky na agrární sektor

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Abstract: Model AGRO-3 is a non-linear optimisation model of the Czech agrarian sector which is based on principles of the market equilibrium on the three markets which create the agrarian sector: market 1 – agricultural products, market 2 – food industry products, market 3 – retail and human consumption of food products. Exogenous variables of the model are represented by general macroeconomic conditions (world prices of agricultural commodities, inflation, exchange rate of the national currency to USD, incomes of the population etc.), internal economic conditions of the Czech agriculture (cost of agricultural producers in the market 1, functional relations between costs and market prices in the markets 2 and 3, food consumption and economic behaviour of population in the base year) and conditions of the agrarian policy including international commitments of the Czech Republic. Endogenous variables are represented by the production amount of all commodities, market prices on all markets and costs in the markets 2 and 3 (non-linear constraints of the model), further corresponding quantities of food consumption acceptable by the population related to food market prices and finally possible exports and imports on all markets. Optimisation criterion is profit of agricultural producers, processors and retailers. The model enables to solve various questions of the agrarian policies on the development of the national agrarian sector. At present the model AGRO-3 is modified for conditions of the Lithuanian agrarian sector in the Lithuanian Institute of Agrarian Economics, Vilnius.

Key words: macroeconomic models, market equilibrium, agrarian market, agrarian policy, supply and demand, food consumption, non-linear optimization

Abstrakt: Model AGRO-3 je nelineární optimalizační model českého agrárního sektoru, založený na principech tržní rovnováhy tří trhů tvořících agrární sektor: trh 1 – zemědělské produkty, trh 2 – produkty potravinářského průmyslu, trh 3 – maloobchod a lidská spotřeba potravinářských produktů. Exogenní proměnné modelu jsou reprezentovány obecnými makroekonomickými podmínkami (světové ceny zemědělských komodit, inflace, směnné kurzy národní měny k USD, příjmy populace atd.), interními ekonomickými podmínkami českého zemědělství (náklady zemědělských výrobců na trhu 1, relace mezi náklady a tržními cenami na trhu 2 a 3, spotřeba potravin a ekonomické chování populace v bazickém roce) a podmínkami agrární politiky včetně mezinárodních závazků ČR. Endogenní proměnné jsou reprezentovány objemem produkce všech komodit, tržními cenami na všech trzích a náklady na trhu 2 a 3 (nelineární omezení modelu), dále korespondujícími objemy spotřeby potravin akceptovatelnými populací ve vztahu k tržním cenám potravin a konečně potenciálními exporty a importy na všech trzích. Optimalizačním kritériem je zisk zemědělských výrobců, zpracovatelů a maloobchodu. Model umožňuje řešení různých otázek agrární politiky ve vztahu k rozvoji národního agrárního sektoru. V současné době je model AGRO-3 modifikován pro podmínky litevského agrárního sektoru v Lithuanian Institute of Agrarian Economics ve Vilniusu.

Klíčová slova: makroekonomické modely, tržní rovnováha, agrární trh, agrární politika, nabídka a poptávka, spotřeba potravin, nelineární optimalizace

INTRODUCTION

For mathematical modelling of different variants of the agrarian policy in the Czech Republic, there was developed a partial equilibrium model of the agrarian sector (AGRO-3). This model is based on the supply and demand equilibrium for three markets – the market of agricultural commodities (market 1), the market of processed commodities (market 2) and the market of final food products (market 3). Exogenous variables of the model AGRO-3 are general macroeconomic conditions (world prices, inflation, exchange rate, income of population etc.), special economic conditions of the Czech agrarian sector (costs of agricultural commodities, functional relations between incomes and costs in the markets 1–3, initial food consumption in the basic year, income and food demand elasticities etc.) and conditions of the agrarian policy and international commitments of the Czech Republic (production quotas, tariffs etc.). Endogenous variables of the model AGRO-3 are production volumes,

domestic prices, processors and retailers costs, target food demand and exports and imports in all markets. The model AGRO-3 is a non-linear optimisation model with the objective function – profit of producers, processors and retailers. This model was used for the evaluation of the accession impacts of the Czech Republic to the EU in the sphere of the agrar sector (Kraus et al. 1997, 1998).

BASIC ASSUMPTIONS

We define agrarian sector as a part of the national economy which contains, on the supply side, such production which has its origin in the domestic agricultural production, and on the demand side the whole human consumption of final food products which has its origin either in domestic production, or in imports. We assume that the agrarian sector consists of three markets:

market 1 – market of agricultural commodities (set K1), where supply is created by the domestic production of farmers and imports, and demand is created by food producers (processing industry),

market 2 – market of food processed commodities (set K2), where supply is represented by the domestic food processing production and imports, and demand by the retailers,

market 3 – market of tradable (final) food products (set K3), where supply is created by retailers, and demand by all consumers,

consumers (set K4) are represented in the model by the indicators related to the average inhabitant and the whole number of inhabitants. It deals with the following indicators:

- human consumption of purchased food products which the consumer purchases in the market number 3,
- human consumption of self-production foods which are not purchased in the market 3 (as a part of consumption, e.g. pig meat, eggs),
- the other expenditures which are provided by the consumer outside the market 3 (e.g. catering, dressing, transport, education, culture, sport etc.).

PHYSICAL TRANSFORMATIONS

– agricultural production

$$xZEM\_TUZ_i = P_i * V_i \qquad for\ i \in K1$$

$xZEM\_TUZ_i$ (model variable) – total amount of the domestic production of the agricultural commodity i

P_i (model variable) – crop area, or average number of heads of an animal category related to commodity i,

V_i (model constant) – per hectare yield of a crop, or coefficient of the final production per 1 average head related to the commodity i;

– relations among average numbers of animals

$$P_i = P_{zi} * kPRUM_{i,zi} \qquad for\ i, zi \in K1$$

P_{zi} (model variable) – average number of heads of the basic category (e.g. cows)

P_i (model variable) – average number of heads of non-basic categories (e.g. calves, heifers, fattening)

$kPRUM_{i,zi}$ (model constant) – coefficient expressing average number of category i related to 1 head of the basic category zi

– feed consumption

$$xKRM_{i,j} = kKRM_{i,j} * P_j \qquad for\ i, j \in K1$$

$xKRM_{i,j}$ (model variable) – feed amount i consumed by the animal category j

$kKRM_{i,j}$ (model constant) – consumption coefficient of feed commodity i by 1 head of the category j

P_j (model variable) – average head number of the category j;

– food processing

$$xPOTR\_TUZ_i = \Sigma_{j \in K1} (kVS_{i,j} * xZEM_j) + \Sigma_{j \in K2} (kVS_{i,j} * xPOTR_j)$$

$$for\ i \in K2$$

$$xZEM_j = xZEM\_TUZ_j + xZEM\_IMP_j \qquad for\ j \in K1$$

$$xPOTR_j = xPOTR\_TUZ_j + xPOTR\_IMP_j \qquad for\ j \in K2$$

$xPOTR\_TUZ_i$ (model variable) – domestic food production of the processed commodity i

$xZEM_j$ (model variable) – total amount of the agricultural raw material j needed to the domestic production $xPOTR\_TUZ_i$

$kVS_{i,j}$ (model constant) – intermediate consumption coefficient of the agricultural raw material $j \in K1$, or food processed raw material $j \in K2$ for the final food processed $i \in K2$,

$xZEM\_TUZ_j$ (model variable) – domestic production of the agricultural commodity j

$xZEM\_IMP_j$ (model variable) – import of the agricultural commodity j

$xPOTR\_TUZ_j$ (model variable) – domestic production of the food processed commodity j

$xPOTR\_IMP_j$ (model variable) – import of the food processed commodity j

– retail sector

$$xOBCH_i = xPOTR_j \qquad for\ i \in K3\ and\ j \in K2$$

(i,j) – a couple of retail commodity i which corresponds to food processed commodity j

$xOBCH_i$ (model variable) – total amount of the commodity i which is supplied by retailers to consumers in the market 3

$xPOTR_j$ (model variable) – total amount of the commodity j which is purchased by retailers in the market 2 (either from domestic production, or from import)

– food consumption and the other non-food expenditures

$$xSPOT_i = xSPOT\_OBYV_i * POBYV \quad for\ i \in K4$$

$xSPOT_i$ (model variable) – total consumption of the purchased final food commodity i, or total expenditures of non-food commodity i

$xSPOT\_OBYV_i$ (model variable) – total consumption of the purchased final food commodity i, or total expenditures of non-food commodity i per capita

$POBYV$ (model constant) – number of inhabitants

FINANCIAL TRANSFORMATIONS

– costs of agricultural commodities

$$nZEM_i \quad for\ i \in K4$$

$nZEM_i$ (model constant) – average cost of the unit production of the agricultural commodity i, given on the base of real data or out-of-model predicted data

– prices of agricultural commodities

$$cZEM_i = nZEM_i * (1 + mZEM_i/100) \quad for\ i \in K1$$

$cZEM_i$ (model variable) – unit price of the agricultural commodity i

$mZEM_i$ (model variable) – profit margin of the agricultural commodity i

(feasible values are $cZEM_i > 0$, but $mZEM_i$ can have positive and negative values)

– costs of food processed commodities

$$nPOTR_i = f(cZEM_{j1}, cZEM_{j2}, \ldots) \quad for\ i \in K2\ and\ j1, j2, \ldots \in K1$$

$nPOTR_i$ (model variable) – unit cost of the food processed commodity i

$cZEM_{j1}$, $cZEM_{j2}$, ... (model variables) – market prices of main agricultural raw materials which enter the processing of the commodity i

f – functional relation of food processing costs to agricultural commodity prices (feasible values are $nPOTR_i > 0$);

– prices of food processed commodities

$$cPOTR_i = nPOTR_i * (1 + mPOTR_i/100) \quad for\ i \in K2$$

$cPOTR_i$ (model variable) – unit price of the food processed commodity i

$mPOTR_i$ (model variable) – profit margin of the food processed commodity i

(feasible values are $cPOTR_i > 0$, but $mPOTR_i$ can have positive as well as negative values)

– costs of retailed commodities

$$nOBCH_i = kOBCH_{i,j} * cPOTR_j \quad for\ i \in K3\ a\ j \in K2$$

$nOBCH_i$ (model variable) – necessary needed cost for retail of the final food commodity i

$cPOTR_j$ (model variable) – unit price of the food processed commodity j

$kOBCH_{i,j}$ (model constant) – coefficient of necessary cost needed for the retail of the commodity i in relation to the price of the purchased adequate food processed commodity j

– prices of retailed commodities

$$cOBCH_i = nOBCH_i * (1 + mOBCH_i/100) \quad for\ i \in K3$$

$cOBCH_i$ (model variable) – unit price of the commodity i

$mOBCH_i$ (model variable) – profit margin for the commodity i

(feasible values: $cOBCH_i > 0$, $mOBCH_i$ can have positive as well as negative values);

– prices of consumer's commodities

$$cSPOT_i \quad pro\ i \in K4$$

$cSPOT_i$ (model variable) – unit price of the consumer's commodity $i \in K4$, where $cSPOT_i = cOBCH_j$, if the commodity i is identical with some retailed commodity $j \in K3$, or $cSPOT_i = 1$, if the commodity i represents self-production, or $cSPOT_i = 1$, if the commodity i represents non-food expenditures

MARKET EQUILIBRIUM CONDITIONS

– balance of sources and usage

$$xPZA_i + xDOM_i + xIMP_i = xTSP_i + xEXP_i + xEXPS_i + xKZA_i$$
$$for\ i \in K = K1 + K2 + K3 + K4$$

where on the left side of the equation there is the total supply of the commodity i (the sum of all sources), on the right side of the equation there is the total demand for the commodity i (all types of the commodity usage)

– balance of total domestic consumption

$$xTSP_i = \sum_{j \in K} (matTSP_{i,j} * xDOM_j)$$
$$for\ i \in K = K1 + K2 + K3 + K4$$

$matTSP_{i,j}$ (model constants) – matrix of the unit domestic consumption (intermediate consumption and final consumption) which contains not only technological coefficients of intermediate consumption, but also other types of coefficients (e.g. number of inhabitants)

– consumer's demand equations

$$xSPOT_i = SPOT\_B_i * xZMSPOT_i$$

$$xZMSPOT_i = kELAP_i*(kINDP-1) + + \Sigma_{j \in K4} (kELAC_{i,j}*(xINDC_j-1)) + 1$$

$$cSPOT_i = cSPOT\_B_i * xINDC_i \qquad for\ i \in K4$$

$xSPOT_i$ (model variable) – final (computed) consumer demand for the commodity i in the target year
$SPOT\_B_i$ (model constant) – basic (given) consumer demand for the commodity i in the basic year
$xZMSPOT_i$ (model variable) – final (computed) change demand coefficient in the target year related to the basic year
$kELAP_i$ (model constant) – given income elasticity for the commodity i
$kINDP$ (model constant) –given index of the consumer's income increase
$kELAC_{i,j}$ (model constant) – given consumer's demand price elasticity for the commodity i related to the consumer price change of the commodity j
$xINDC_j$ (model variable) – final (computed) consumer price index of the commodity j
$cSPOT_i$ (model variable) – final (computed) consumer price of the commodity i in the target year
$cSPOT\_B_i$ (model constant) – basic (given) consumer price of the commodity i in the basic year

– equality of consumer and retail prices

$$cSPOT_i = cOBCH_j \qquad i \in K4\ and\ j \in K3$$

– equations of demand price elasticities (Frisch 1958):

$$kELAC_{i,i} = given\ values \qquad for\ all\ i \in K4$$

$$kELAC_{i,j} = -kELAP_i*kALFA_j*(1+kELAC_{j,j}) / / (1 - kELAP_j*kALFA_j) \qquad for\ all\ i, j \in K4,\ i \neq j$$

$$kALFA_i = (cSPOT\_B_i * SPOT\_B_i) / \Sigma_{j \in K4} (cSPOT\_B_j * * SPOT\_B_j) \qquad for\ all\ i \in K4$$

$kELAC_{i,i}$ (model constant) – given direct demand price elasticity for commodity i
$kELAC_{i,j}$ (model constants) for $i \neq j$ – computed cross demand price elasticity
$kALFA_j$ (model constant) – computed coefficient of the expenditure share of the commodity j in the total sum of consumer expenditures in the basic year.

EXPORT, IMPORT, WORLD AND REFERENCE PRICES

– import prices

$$cIMP_i = cREF_i * (1 + kCLO_i /100) * kXR \qquad for\ i \in K = K1 + K2 + K3 + K4$$

$cIMP_i$ (model constant) – computed import price in CZK/t for the commodity i for the target year
$cREF_i$ (model constant) – given reference (world) price in USD/t for the commodity i for the target year
$kCLO_i$ (model constant) – import tariff in per cent for the commodity i for the target year
kXR (model constant) – exchange rate in CZK/USD

– export prices for non-subsidised export

$$cEXP_i = (cSVET_i - kDN_i) * kXR \qquad for\ i \in K = K1 + K2 + K3 + K4$$

$cEXP_i$ (model constant) – computed export price in CZK/t for the commodity i for the target year
$cSVET_i$ (model constant) – given world price in USD/t for the commodity i for the target year
kDN_i (model constant) – transport cost from an average farm to world market in USD/t for the commodity i for the target year
kXR (model constant) – exchange rate in CZK/USD.

– export prices for subsidised export

$$cDOM_i \qquad for\ i \in K = K1 + K2 + K3 + K4$$

$cDOM_i$ (model variable) – target (computed) domestic market price (for all markets) for the commodity i.

OPTIMISATION CRITERION OF THE MODEL

As a basic optimisation criterion of the model AGRO-3, there was chosen the indicator of the maximum profit of the whole agrarian sector which is achieved in markets 1, 2 and 3 with market equilibrium conditions.

– total sales

$$xTRZ = \Sigma_{i \in K1+K2+K3} (cDOM_i*(xDOM_i - xEXP_i - xEXPS_i) + + cEXP_i*xEXP_i + cDOM_i * xEXPS_i)$$

– total costs

$$xNAK = \Sigma_{i \in K1+K2+K3} (nDOM_i * xDOM_i + cIMP_i * xIMP_i)$$

– total profit

$$xZIS = xTRZ - xNAK$$

– optimization criterion

max (xZIS)

where

$nDOM_i$ (model constant) – unit cost on the domestic production of commodity *i*

xTRZ, *xNAK*, and *xZIS* (model variables) – total sales, costs, and profit of the agrarian sector, respectively

MODELLING AGRARIAN POLICY VARIANTS BY THE HELP OF THE MODEL AGRO-3

The model AGRO-3 serves for simulation and proving of different variants of the agrarian policy to the target (chosen) year. It is obvious that the model AGRO-3 is – like all mathematical models – a simplification of the reality. From that implies that this model enables to implement only some elements of the agrarian policy:

a) macroeconomic assumptions
- development of world and reference prices of chosen commodities
- commitments of the Czech Republic to the WTO: maximum import tariffs, minimum import access to domestic market, maximum physical and financial amount of subsidised exports
- production quotas issuing from the relations of the CR to the EU
- development of exchange rate of CZK to USD
- development of average incomes of the population
- demographic development

b) agricultural assumptions
- development of per hectare yields and animal production intensity indicators
- development of cost items with respect to the inflation
- profit (loss) margins
- maximum usable area of agricultural land
- feed technology development as a consequence of technological progress
- maximum quotas for individual commodities
- price limits (intervention prices, minimum guaranteed prices etc.)
- agro-environmental limits
- limits of land for non-food usage (e.g. rape seed for fuel)

c) food processing assumptions
- development of technological coefficients
- development of cost functions of food processed commodities in relation to prices of agricultural commodities
- profit (loss) margins of food processors

d) retail sector assumptions
- development of retailer's cost functions
- retailers' profit margins according to individual commodities

e) food consumption assumptions
- food consumption and non-food expenditures in the basic year
- consumer prices in the basic year
- development of non-food expenditures in the target year
- demand income elasticities and direct price elasticities
- minimum and maximum limits for price index changes
- limits of food consumption changes and consumer prices on the base of other than price criteria

CONCLUSIONS

The basic model structure of AGRO-3 contains about 100 indicators representing agricultural production, about 50 indicators for food processing industry, about 40 indicators for retail sector of final food products, about 50 indicators for food consumption sector and non-food expenditures and about 20 other indicators covering non-competitive raw materials and final food products, necessary for functioning of the Czech agrarian sector.

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Arrived on 11th January 2000

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Some aspects of co-operative member share structure

Některé aspekty struktury členských družstevních podílů

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Abstract: This article describes the main features of Lithuanian agriculture which have the impact on agricultural co-operative development. On the basis of the analysis of these factors, the author has proposed a methodology how co-operative member share can be built up. Such methodology is expected to facilitate the establishment of farmer co-operatives.

Key words : co-operatives, member shares, Lithuania

Abstrakt: Práce popisuje hlavní rysy litevského zemědělství , které mají dopad na rozvoj zemědělského družstevního sektoru. Na základě analýzy těchto faktorů doporučuje autor metodologii konstrukce členských podílů v družstvech. Tato metodologie by měla usnadnit vznik zemědělských družstev.

Klíčová slova: zemědělská družstva, členské družstevní podíly, Litva

INTRODUCTION

The development of the co-operation is determined by the current situation and traditions of Lithuanian agriculture. In Lithuania, as in the other post-comunist countries, the conditions for co-operation are quite different from those prevalent in the countries with the developed agriculture and with long standing traditions of co-operation. During the period of the communist regime in Lithuania, all genuine co-operatives were either closed or converted to the communist pseudo co-operatives, which resulted in a negative attitude towards co-operation among the countryside people. Thus, we have to start the development of co-operative from the scratch. Let alone that we have no support of positive traditions but we must struggle against negative stereotypes firmly rooted in people's minds and to persuade them about the benefits of co-operation.

Lithuanian farmers are lacking experience, knowledge and the most necessary means of production. There are many small farms which are unable to withstand competition with the large farms in West and at home. Lithuanian farmers not only need material assistance but also training, qualification improvement, consultancy, etc.

Co-operatives would become more attractive for Lithuanian farmers, if the contribution that every member should invest into co-operative (share contribution) depended on the extent of his participation in the co-operative, it means that the calculated share contribution is proportional to the turnover existing between the member and the co-operative. Besides this, member shares must be collected during certain period of time by setting aside a part of members' profits. Such method of member share build-up is especially favorable for the new members who start their economic activities. However, analysis of the activities of the existing co-operatives shows that the founders of almost all new co-operatives do not calculate members' shares but simply assign share to co-operative members irrespectively of their participation in cooperative business.

The aim of this work is to analyze the specific features of agricultural co-operative establishment in Lithuania and to propose the ways how to accelerate their development.

METHODS OF RESEARCH

There were used statistics, grouping and other economic methods. Share forming classification was created according logistic science.

SITUATION OF LITHUANIAN AGRICULTURE

After the reestablishment of the independence in 1990, Lithuania inherited big state and collective farms (kolkhozes) which on USSR scale were the most productive in the field of agricultural production during the last decades of the Soviet regime. However, even such level of production, fairly advanced in the comparison with the rest of USSR, was significantly below the level of the countries with highly developed agriculture. The per hectare yield of grains was almost two times less than in the West, animal productivity was also relatively low. About 23% of entire workforce was employed in the ag-

riculture, therefore the production for one worker was much lower than in the developed countries In result of this Lithuanian farmers are hardly capable of competition with the farmers of other countries.

The reestablishment of private farms has created necessary conditions for the private initiative and for the increasing of agricultural productivity. However, it needs time and means. Until now, little use has yet been made of the potential for the intensification of agricultural production.

Agricultural co-operatives could contribute a great deal to this process but conditions for their emergence and development are very unfavorable.

One reason why it is so difficult to create agricultural co-operatives is that during the privatization of state enterprises, no account was taken of the interests of farmers. Almost all processing enterprises have already become private (joint-stock) companies. If farmers want to create agri-food processing or trade co-operatives they have to overcome the resistance of big private companies and to be able to compete with them but it is a very difficult thing for the farmers whose economic position is still very precarious.

Agro-service co-operatives are especially important for Lithuanian farmers because many new farmers lack the necessary equipment and funds for acquiring it. In the country, there are lots of very small farms for which it will never be reasonable to buy all the necessary equipment. The number of private agro-service enterprises is very insignificant. The creation of agro-service co-operation is checked by the lack of funds.

The development of co-operatives is made difficult both by the general situation of agriculture and by a very big size difference among various farms. Small farms are predominating. The average size of private farm is 11.8 ha (Lietuvos Republikos 1998).

Many people in Lithuania have land plots with the area less than 3ha. According to the legal status and the way of acquisition, they are classified into two groups: household plots and private farms.

Household plots were distributed to rural inhabitants as means of social security. In the result of land reform, many among rural people were left without any work and subsistence. The parliament of Lithuania (Seimas) has granted all countryside dwellers the right to get plots from 2 ha to 3 ha. Now there are more than 300 000 of such household plots(about 326 000). Their total area makes 18.3% of all agricultural land. Household plots are the only means of subsistence for many persons. However, the income from and productivity of such plots is extremely low, therefore co-operation could help these small farmers to get more income from selling milk or from occasional sales of an agricultural animal. Such household plot owners will never be able to establish a co-operative independently because their economic and financial potential is too weak. Household plot owners would be also interested in agro-service but they have not got a sufficient income to pay for it.

The land reform is continuing and as a result of it new farms are established, the most of which are also very small (Table 1).

Table 1. Size of farms

Size ha	0.3–30	3.1–10	10.1–20.0	20.1–30.0	30.1–50	>50.0
Numbers %	0.8	57.8	29.3	7.8	3.4	0.9

As it is shown in the table, most of the farms are from 1 ha to 20 ha. 99% of all private farms are less than 50 ha. In the difference to other countries where such small farmers have additional income from non-agricultural income, these small farms are the only source of income for almost all Lithuanian farmers.

The reason why the average size of farm is so small was determined by the fact that private farms were established in the process of the restitution of land nationalized by the Soviets to former owners and their heirs. Farms had been small in the pre-war Lithuania. At the time when farms were being consolidated in all countries, Lithuania has returned to the pre-war land patterns. By restitution of the land to heirs of the original owners, it is often divided among them and the farms in consequence are even smaller than they were before the war.

It is also true that bigger farms with several hundreds of own or rented land are starting to appear. There are no exact data about such farms but they are obviously little in numbers.

Besides of private farmers, in Lithuania there still are relatively many so-called agricultural companies which were created on the base of the former kolkhoses. These companies are partly based on co-operative principles and partly on joint- stock company principles. Many of such agricultural companies went bankrupt, however, some of them were quite successful. They are relatively well equipped and provide agro-service to small farmers in their neighborhood. The size of agricultural companies varies from 100 to 2000 and > ha of land (Lietuvos Republikos 1998). They are also the potential members of co-operatives.

Lithuania has also a certain number of state farms. These are farms with training, experimental and research purposes. None of them have any interest to co-operate with the neighboring small private farmers.

Such big variety in size and financial capabilities of Lithuanian farms creates the necessity to look for the way how to harmonize interests of the potential co-operative members and how to find starting capital for co-operative activities.

NEED FOR CAPITAL

It is necessary to accumulate funds for the establishment of a co-operative enterprise and its activities dur-

ing the initial period when the enterprise does not yet yield stable profits. All the expenses for buildings, means of production, inputs, needs for working capital must be calculated. The amounted sum of all these will show the need of capital for the co-operative.

While calculating the requirement of capital, it is important to assess all the necessary expenses. However, one must avoid overestimating them. If the expenses are overestimated, it can be difficult to procure working capital since some of the potential members will become reluctant of membership because of too large initial fee.

On the other hand, underestimating costs is also unacceptable, therefore one should look for the most appropriate and modern equipment, and not for the cheapest one.

ACCUMULATION OF THE CAPITAL NECESSARY FOR THE START OF CO-OPERATIVE ACTIVITIES

In one way or another, its members must accumulate the capital for co-operative. The grant aid is given very seldom. As was already mentioned, the most of farmers lack available funds beyond their necessities. If the initial contribution is relatively large, most of potential members would prefer not to join the co-operative. Therefore, the increase of initial contribution becomes an important check on co-operative development. In some cases, a farmer may own buildings or equipment, which he can supply to the co-operative as a contribution in kind, however, many of potential members have nothing to offer. Besides, not all the equipment offered by farmers is suitable for the co-operative.

In such a situation, the only possible solution is to borrow the capital and reimburse the loan from the profit of the co-operative. The main drawback of this way is that it is acceptable only in the case when the activities of co-operative are sufficiently profitable so that the time needed to reimburse the loan is not too long. The loan must be repaid earlier than the need to renovate the technology will arise. To certain extent, striving after profit clashes with the classical principle of co-operation which is to pay members a bigger price for their products and to sell them goods and services as cheap as possible. In practice, all the profit of the co-operative goes to its members, member shares are also accumulated from the profit.

If the capital of co-operative is accumulated from its profit, it is very important to choose a rational method of calculation of the member profit share and member share . The requirement for capital (the amount of member share) can be determined and profit distributed by using various methods. The most often used are the following:

1. All members are required to contribute the same fee. This method could be acceptable only in those co-operatives where the economic potential of all members is more or less equal.
2. The fees and member profit share are proportional to the size of farms. This method is hardly better than the first one because economic results often are not proportional to the size of the farm.
3. The contribution is proportional to the productive capacity of a member, e.g. the dairy co-operative calculates member share according to the number of cows he keeps. This method is somewhat better but in the conditions of Lithuania it is also not always acceptable because the productivity of animals is different in different farms, different farmers set aside different amounts of production for personal consumption etc.
4. The best method to calculate shares and divide profits is according to members estimated turnover with the co-operative. This method of calculation conforms to the principles of co-operation in the best way. The turnover is the best indicator to assess member's contribution to the co-operative activities. Further in the article we will consider only the latter method.

Frequently, the number of co-operative members and their turnover with the co-operative are in constant flux, therefore members shares of profit and member shares for current year must be calculated annually taking into account the changes in the whole cooperative and individual members' turnovers.

Such method of dividing profit and member shares gives the possibility to give various sorts of incentives for individual members and their groups. For example, it is possible to encourage members to increase the turnover with the co-operative, to make the co-operative more attractive for financially stronger members since it would be difficult to establish the co-operative without their support and often-impossible altogether. Let us consider at first how profit and shares are distributed to all members on equal terms without any privileges.

In this case, in order to calculate the distribution of profit and shares we need to know three main indicators: the initial capital necessary for starting co-operative activities K_p, the profit of the co-operative during one year P_e and the co-operative turnover with members A.

The sum of member shares of the co-operative P is equal to the initial capital necessary for starting co-operative activities: $P = K_p$

The turnover of the co-operative with its members is the sum of the turnover with particular members

$$A = \sum_{i=1}^{n} A_i$$

where n is the number of co-operative members, A_i – i-th member's turnover with the co-operative, in monetary units (monetary units here are Litas or thousand Litas).

Knowing this main indicators of the co-operative, we can start calculating the shares of members and distributing profits. In order to calculate shares, we find out the ratio of share P and turnover A:

$$k_p = P / A \qquad (1)$$

In a similar way we have found the relation between the profit and the turnover. Only in this case not all the profit but only a part of it is taken. Certain part of the profit is left as a reserve for unforeseen circumstances and in order to level out the fluctuations of profit:

$$k_a = P_e \cdot d / A \quad (2)$$

P_c – co-operative's average annual profit in the course of one year;

d – the profit share to be divided, e.g. $d = 0.8$ (80%), $d = 0.9$ (90%), etc.

The share P_i of every member of the co-operative is calculated in the following way:

$$P_i = k_p \cdot A_i \quad (3)$$

THE INSCRIPTION(*) OF INITIAL CONTRIBUTION

In Lithuania only few co-operative members are capable to contribute all or a part of their share during the initial period of the co-operative. Therefore, the initial fee ranges from zero to the amount of entire member's share. This variety creates a lot of problems how to treat these contributions.

When all members contribute the same initial fee, the following procedure is adopted. During the period of share accumulation, the profit is distributed to members and inscribed in share accounting books but money is used for the reimbursement of the debt.

In the case when initial contribution is different, it is possible to apply different procedures.

The first option. The best way for the members who have paid in their fee is to receive at once the part of profit, which belongs to them. In this case, the initial contribution is not taken into account while calculating the loan and share. For the purpose of calculation, it is equated to the loan, which must be reimbursed during the share accumulation period. In this case, during the period of member share accumulation loans are reimbursed to banks and all the amount of initial contribution is paid out to the members, which have contributed it.

The part of profit set aside for shares is divided to all members proportionally to their turnover with the co-operative. Small (limited) share of profit is returned to members proportionally to the capital contributed by them. But in this procedure this part of profit is not taken into account.

The part of the profit which is received by a member P_{ei}, does not depend on the amount of his initial contribution:

$$P_{ei} = k_a \cdot A_i \quad (4)$$

Such procedure encourages members to contribute their initial fees, however, it prolongs the time in which the loans are reimbursed. The accumulation of shares becomes a long process. Those members who contribute their initial fees accumulate their shares earlier than those members who have not done it. The greater the initial fee will be, the more rapidly the entire share will be accumulated. Through all the remaining time until the end of share accumulation period, profit shares are paid out to these members who have already accumulated their member shares.

Second option. The loan is reimbursed more quickly when all the profit of co-operative is used to reimburse the loan and the payment of profit share related to initial contribution is postponed until all the loan is reimbursed.

In this case, in the first stage only the share P_s equal to the amount of the loan must be accumulated.

$$P_s = K_s \quad (5)$$

where P_s is the part of members share for the reimbursement of the loan, $K_s = K_p - K_n$ – the amount of loan, K_p – capital necessary for setting the co-operative, K_n – the sum of initial fees (own capital of the co-operative).

The profit is distributed to the members in the following way:

The part of members share not paid in by the member P_{si} is found:

$$P_{si} = P_i - P_{pi} \quad (6)$$

where P_{si} - the part of member's share not yet paid in by the i-th member, P_i – the share of member in question, P_{pi} – the initial fee of member in question.

Then $P_s = \sum_{i=1}^{n} P_{si}$ and the coefficient of the annual-profit share, $K_{as} = P_e / K_s$

where P_e – the part of annual profit of the year in question which goes for member shares.

During the year the increase of member's share will be:

$$P_{msi} = k_{as} \cdot P_{si} \quad (7)$$

After the reimbursement of the entire loan, the next stage starts. In the first stage, the part of profit, which belongs to the members who have contributed their initial fees, was used to increase the shares of the remaining members. In the second stage, this part of profit not received by the farmers must be reimbursed to them. The best and fairest option would be to allot all the profit for the members who have paid their initial fees.

The part of the co-operative profit which belongs to these members with initial fees but which is not yet reimbursed to them is as follows:

$$K_n = \sum_{i=1}^{n} P_{pi} \quad (8)$$

The duration of the second two-stage option is the same as the duration of share accumulation period of the first option. In this way, the separation of bank loan reimbursement and the reimbursement of the part of profit due to the members into two different stages, the period of

external loan reimbursement is considerably shortened, members who have not contributed fees can accumulate their shares more rapidly. These members who have contributed their fees start to receive their part of profit later than in the first option, however, they can get back all the profit due to them during the same period as in the first option.

THE PERIOD IN WHICH SHARES ARE ACCUMULATED

If the capital of the co-operative is accumulated from its profits, it is very important to calculate (even if approximately) the period in which shares will be accumulated. This duration determines for which period of time the loan shall be taken and how much of interest will be paid. The graphic of loan reimbursement is set up according to the development of share accumulation process.

The period in which member shares are accumulated and the methods of its calculation depends on how we will treat the initial fees .

The volume of the profit of the co-operative determines the period in which the shares are accumulated.

Initial period of the newly created enterprise can be subdivided into three periods.

1. The period of activity with the loss (construction of the enterprise). The share is not accumulated. Its duration is m_n
2. The period in which the profit appears and starts to increase. Duration of this period is m_a. The amount of accumulated member shares is P_c.
3. The period in which the co-operative receives the planned profit (m_p) during which the rest of shares P_e is accumulated:

$$P_e = P - P_c \qquad (9)$$

All the duration M of the share accumulation period is equal:

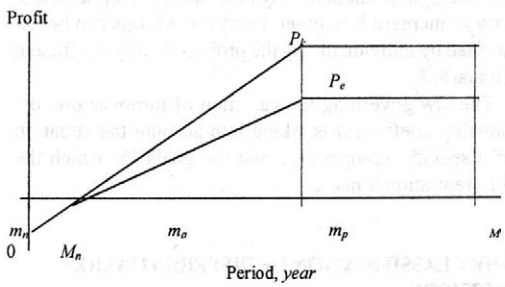


Figure 1. Dynamics of co-operative profit

P_k – entire profit of the co-operative, P_e – the part of profit allotted for member shares

$$M = m_n + m_a + m_p \qquad (10)$$

The part of shares accumulated during the period in which profit increases:

$$P_c = m_a \cdot P_{ea} \qquad (11)$$

where P_c is the part of shares accumulated during the period m_a in which profit increases, P_{ea} – average annual profit during the period in which the profit increases.

If the profit increases evenly:

$$P_{ea} = 0.5 \cdot P_{ep} \qquad (12)$$

then $P_e = 0.5 m_a \cdot P_{ep}$

where P_{ep} – the part of planned profit allotted for share contributions annually.

The duration of the third period m_p is equal to:

– when the payment of the part of the profit related to the initial fees is started to be paid before the accumulation of all member shares:

$$m_p = P_e / P_{ep} \qquad (13)$$

– when the payment of the part of the profit related to the initial fee is started to be paid only after the accumulation of all member shares

$$m_{ps} = (P_e - \sum P_{pi}) / P_{ep}, \qquad (14)$$

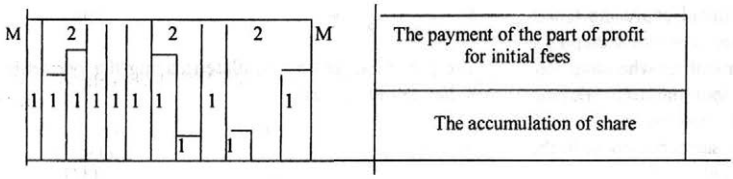
where P_{pi} is the sum of all initial fees.

SHARE CONCESSIONS (PRIVILEGES)

Often it is impossible to establish a co-operative because the economically strongest farms do not want to join. The main reason of it is different initial fees but the same opportunities to participate in managing co-operative and a bigger risk while taking loans.

One of the ways to make co-operative more attractive for bigger farmers and encourage them to co-operate with smaller farms is to introduce share privileges or to increase the part of profit which is paid out to the bigger members.

When all members who join the co-operative have roughly the same financial capability, no privileges can be allowed. The situation becomes different if the difference between financial capability of various potential members can be tens and hundreds of times different and the same is true about their turnover with the co-operative. In the case of such big differences in contributions to co-operative, certain privileges are completely justified and can be recommended.



a – the payment of the part of the profit related to the initial fee is started to be paid before the accumulation of all member shares
b – the payment of the part of the profit related to the initial fee is started to be paid only after the accumulation of all member shares
1 – accumulation of shares, 2 – payment of part of profit

Figure 2. The duration of share accumulation

Our research shows that the profitability of a co-operative depends on the amount of its turnover (Horizontaliosios ir vertikaliosios 1998).

The bigger is the turnover of a co-operative, the bigger is its profit. Usually the distribution of profit not only compensates privileges given to bigger farms but gives benefit to other members as well.

Let's take an example. After joining the co-operative by its largest members, its turnover will increase so much that the profit of the co-operative will increase by 15%. Let's say 10% of this profit will be allotted for the stimulation of large-scale members. In this case, the income of remaining members will increase by 5% and this will be achieved only because big farmers have joined the co-operative.

In any case, the privilege should be given only when it will result in benefits not only for those who get it but also for all other members. The magnitude of the privilege must depend on the benefit to the co-operative. The more useful a member is to the co-operative, the greater privilege can be granted to him.

The privilege can be given in two ways:
- by differentiating members' shares; in this case the privilege applies only for the period of share accumulation;
- by differentiating the part of the profit paid to the members; such privilege can be of an unlimited duration.

Both these methods have the same effect - both affect the duration of the period in which the shares are accumulated. The greater privilege is given to a member, the more quickly he can accumulate his share from the profit of the co-operative. At the same time, the duration of share accumulation increases for the remaining members. If we consider the increase in co-operative profit for which the privilege was granted, we will see that this increase in share accumulation duration for remaining members does not necessarily mean that the co-operative will need longer time for the members' shares accumulation.

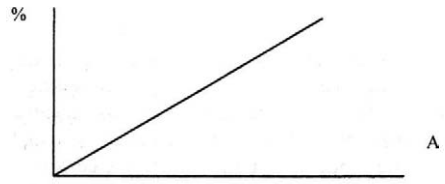


Figure 3. The influence of the volume of the turnover on the profitability of the co-operative

By differentiation of members' shares, it is possible to achieve the following objectives:
- greater profitability of the co-operative since the increase in the turnover almost always results in greater profitability;
- the relation between the shares that must be accumulated and the total turnover is smaller, because if big member join the co-operative, the need of funds in the initial stage of the activity is almost always less than the increase in turnover;
- there is more chance to get initial contribution in kind because usually only big members have the equipment and buildings necessary for the co-operative;
- more rapid increase of profit; that means the time when co-operative starts to get planned profit is achieved more quickly;
- because of the increase in profit and lower share coefficient, the time needed for share accumulation will be reduced;
- it is easier to get loans.

The share is differentiated by changing (individualizing) the relation of share and turnover for the member

$$k_{ai} = P_{ei} / A_i$$

The methods how to change these relations and how to calculate them are the same in both cases.

In both cases, the extent of the privilege is chosen, that means how many % of the share must be reduced or the profit increased. After reduction of the share for some members, it is calculated by how much it will be necessary to increase it to other members. All this can be expressed by individualizing the proportionality coefficient of share, k_p.

The law governing the variation of turnover proportionality coefficient is taking into account the situation of a specific co-operative and the goals for which the differentiation is made.

THE CLASSIFICATION OF DIFFERENTIATION METHODS

The method of differentiation of member's share or member's part of profit is determined by the law of the variation of proportionality coefficient k_p or k_a.

We propose two main methods of differentiation: group differentiation and individual differentiation, and different combinations of these methods (mixed methods).

By applying the **method of group differentiation,** members are subdivided into two or three groups. It is not rational to have more than three groups. Non-differentiated distribution of shares and profit also can be considered a subset of this method when there is only one group, which comprises all members. At first the group of privileged members is set up. This group comprises only these members whose joining the co-operative will result in benefits to the entire co-operative. Because the shares of this group are diminished, they are increased for all other members because the requirement for shares remains the same. It is possible to increase all shares in the measure (then we will have two groups) or to one group more to other less(then we will have three groups). The distribution of profit is differentiated in the same way: privileged members get more, other members less.

Shares/profit of a group of members is calculated by multiplying the turnover of every member by the proportionality coefficient of share/part of profit, which is selected for this group.

Such group differentiation is the most suitable in the case when the turnover of different groups with the co-operative is very different and there is no difficulty to attribute a member to this or that group.

By the means of the individual differentiation, individual proportionality coefficient is chosen or calculated for every member. This method is used when it is preferable to encourage members to increase their turnover with the co-operative. In the case of such differentiation, even a small increase in the turnover raises profit shares or diminishes share contribution.

The mixed method of differentiation is the combination of these two methods (group and individual). Using one method, the remaining by using another method, differentiates part of the members. Part of members is assembled

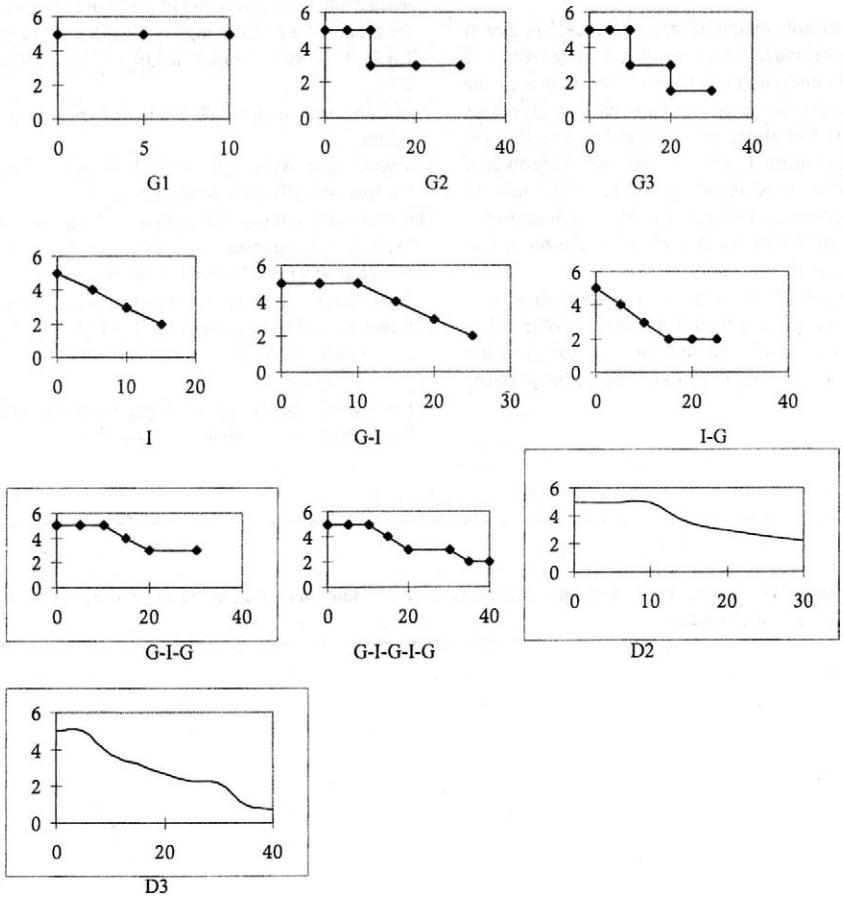


Figure 4. The variation of the coefficient of proportionality between share and turnover in various methods of share differentiation

G1 – not differentiated (1 group); G2 – differentiation of two groups; G3 – three groups, I – individual. G-I group-individual, I-G individual group, G-I-G – group-individual-group, G-I-G-I-G – group-individual-group-individual-group

into one or more groups and the same proportionality coefficient is calculated for all the members of one group. Members who remain outside groups are differentiated in the individual way.

Such differentiation is used in the cases when the turnover of part of members with the co-operative is clustered into groups of different size and the turnover of remaining members falls in within these groups. In such cases, there are no abrupt jumps from one group into another. The transition is further smoothed out by individual share differentiation.

The difference of the method of share differentiation by diapason from the previous methods is that instead of assigning the proportionality coefficients to member groups, diapasons of turnover are being set up and share coefficients assigned. If the turnover of a member is big and comprises several diapasons, in every of these diapasons it is multiplied by another coefficient (Figure 4).

CONCLUSIONS

After the reestablishment of independence, the size of Lithuanian farms varies in a very broad range from 1–2 up to several hundreds of hectares. That is one of the main reasons why the co-operative movement develops so slowly. This fact affects negatively the general development of agriculture. In order to promote the growth of the co-operation, it is necessary to find ways how to encourage big farmers and agricultural companies to co-operate with small farmers. After the evaluation, it was possible to make these conclusions:

1. While planning the activities of a co-operative, it is very important to calculate duly the amount of member shares. We were unable to find the description of the methodologies of such calculation in available publications.
2. The methodology for calculation proposed by us allow calculating the need for member shares.
3. If farmers are not able to contribute all the amount of member shares, they are proposed to accumulate the shares from the profit of the co-operative
4. In some cases it would be useful to provide profit/share privileges for some of the members. In this way, big farmers can be encouraged to join the co-operative and in this way they can benefit the entire co-operative by their participation.
5. We propose various methods of incentive, some of which give privilege to a group of members, some give an additional incentive to increase the turnover with the co-operative.
6. It is worth to give privileges in the cases when there is a very big difference among the economic potentials of members.

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Arrived on 25th October 2000

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Distributed lag models and the Durbin *h*-test[1]

Dynamické ekonometrické modely s časovo posunutými premennými a Durbinov h-test

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Abstract: Several factors were responsible for the increase of wine consumption in Australia, namely growing public awareness and appreciation of table wines reinforced by changes in relative prices and incomes. There are number of questions relating to the growth of wine market which are of interest to policy makers and wine producers and consumers. The aim of the study was to provide an explanation of the developments, which have given rise to systematic change in Australian demand for wine. The approach employed in this study was, as with most of predecessors, partial and neoclassical and the study data sources are similarly highly aggregated time series. The focus of the study was to make marginal but critical improvements to the theory, data and empirics of what has been done in earlier studies which relied on data of even lover quality than was collated for this study. The aim of the study was to improve the specification of the demand for wine in Australia by obtaining improved estimates (measures) of demand elasticities with respect to relative prices (wine and beer), income, advertising expenditure, and the impact of migration. From modest changes in methodology, with greater attention paid to model specification, the definition of variables and data quality, improvements in the quality of the estimates of elasticities of some moment have been achieved. While not all defects of earlier estimates have been overcome, it is felt that the own price, cross price and income elasticities derived from this study provide more reliable guides to policy makers than have been previously available. The study is designed to be of benefit to producers, policy makers and consumers. Producers, faced with decisions about volume of production and relative prices, benefit from information about price and income elasticities of demand or the likely market response to changes in the quality of products marketed. In addition, from improved modelling of the wine industry, consumers, wineries and distributors acquire an improved understanding of the wine market. There are concomitant advantages for marketing institutions, taxation policy and the body of market knowledge.

Key words: Durbin-Watson *d*-statistics, Durbin *h*-statistic, demand, consumption, static model, dynamic model, residuals, correlation, regression

Abstrakt: Efekt niekoľkých faktorov sa prejavil na zvýšení spotreby vína. Najmä vyššie hodnotenie kvality stolových vín verejnosťou, ale aj zmeny relatívnych cien vín a príjmov obyvateľov mali vplyv na vyššiu spotrebu vína. Existuje viac nezodpovedaných otázok týkajúcich sa zväčšovania sa trhu s vínom, ktoré zaujímajú spotrebiteľov, producentov, ale najmä ľudí tvoriacich stratégiu na trhu. Cieľom štúdie bolo vysvetliť dôvody rozvoja trhu s vínom, ktoré spôsobili systematické zmeny v dopyte po víne v Austrálii. Prístup k štúdiu danej problematiky bol podobný ako vo väčšine predchádzajúcich štúdií parciálny a neoklasický a dáta sú agregované údaje časových radov. Nasmerovanie štúdie bolo ukázať marginálny ale kritický posun v teórií, dátach a empirických výsledkoch skorších štúdií, ktoré sa spoliehali na dáta nižšej kvality než táto štúdia. Interes štúdie bol zameraný na zlepšenie špecifikácie dopytu po víne v Austrálii na základe zlepšenia odhadov elasticít dopytu podľa relatívnych cien (víno, pivo), príjmov, reklamy a efektu imigrácie. Zmeny v metodológii, presnejšia špecifikácia modelov, premenných a kvalita dát priniesli zlepšenie kvality výstupov – odhadov elasticít. Nie všetky slabiny predchádzajúcich štúdií boli prekonané, avšak vlastná cenová elasticita, elasticita ceny substituenta (piva) a elasticita príjmu ukazujú stratégom na trhu lepšie možnosti odhadu chovania sa trhu. Táto štúdia je smerovaná k tomu, aby sa úžitok prejavil u producentov, trhových stratégov a spotrebiteľov. Producenti stojací pred rozhodnutím o množstve produkcie a odhadom cien môžu profitovať z informácií o cenových a príjmových elasticitách dopytu, alebo možných vplyvoch, ktoré zmeny v kvalite produktov prinesú na trh. Ďalej je potrebné zdôrazniť, že zlepšeným modelingom produkcie vína, spotrebitelia, výrobcovia a distributéri získajú lepším pochopením trhu. A naviac existuje ďalší kladný efekt vyplývajúci z výsledkov tejto štúdie pre daňovú politiku, inštitúcie trhu a vedomosti o trhu.

Kľúčové slova: Durbin-Watson *d*-test, Durbin *h*-test, demand, spotreba, statický model, dynamický model, rezídua, korelácia, regresia

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[1]This article is the part of the thesis submitted in total fulfilment for the degree of Master of Agricultural Science at La Trobe University, School of Agriculture, Melbourne.

[2] I wish to express my sincere gratitude to all those who helped me with this work, but first of all to my supervisor Acting Profesor J.J. Quilkey, at that time the Dean of School of Agriculture at La Trobe.

INTRODUCTION

During the thirty years of 1955 to 1986, the alcoholic beverages industry in Australia has undergone considerable change in the market shares of its components. Consumers' attitudes to wine in Australia began to change in the early 1950's, when the annual consumption of "all wine", including fortified wine, was about 4.5 litres per capita. Until then, fortified wines constituted up to 90 per cent of the total market. Fortified wines continued to dominate the market until the end of the 1960's, when nascent changes in consumer preferences in favour of table wine accelerated, so that table wines accounted for 78 per cent of the annual 21.13 litres per capita of total wine consumption in 1987. Since 1955, table wine consumption increased from 0.85 litres to 15.87 litres per capita in 1987. At that time it was seen that the wine consumption per capita in Australia was at the level of satiation (Table 1).

Several factors were responsible for the increased consumption. Growing public awareness and appreciation of table wines was reinforced by changes in relative prices and incomes. There are number of questions relating to the growth of wine market which are of interest to policy makers and wine producers and consumers. Some results of the study contradict the previous research, which found: beer and wines to be complements; a high-income elasticity of demand for wine. Thus, the aim of the study was to provide an explanation of the developments, for which different models were applied.

Table 1. Household Disposable Income, Price of Wine and Beer 1955/56–1985/86

Year	CPI[a]	Income[b]	Price of Wine[c]	Price of Beer[d]	Domestic Consumption[e]
1955/56	24.5	3328.3	84.1	89.4	4.98
1956/57	25.9	3272.3	84.5	97.7	5.16
1957/58	26.2	3172.6	87.8	97.7	5.11
1958/59	26.6	3302.3	91.7	96.6	5.15
1959/60	27.3	3505.6	96.3	94.9	5.19
1960/61	28.4	3510.7	96.6	93.0	5.05
1961/62	28.5	3563.2	100.7	93.3	5.08
1962/63	28.6	3734.4	102.1	93.4	5.23
1963/64	28.8	4010.9	102.4	94.8	5.47
1964/65	29.9	4095.4	104.7	92.3	5.55
1965/66	30.9	4081.7	109.1	97.1	6.04
1966/67	31.8	4297.8	111.0	98.4	6.76
1967/68	32.9	4246.7	114.9	99.1	7.49
1968/69	33.7	4577.4	127.0	99.7	8.15
1969/70	34.8	4746.4	130.4	99.8	8.83
1970/71	36.5	4873.9	136.4	101.9	8.46
1971/72	38.9	5057.6	135.7	100.2	8.70
1972/73	41.3	5437.6	126.6	99.5	9.62
1973/74	46.6	5747.2	115.7	94.2	10.79
1974/75	54.5	5953.4	115.0	92.7	12.09
1975/76	61.5	6096.7	122.5	103.2	12.88
1976/77	70.0	6024.1	116.4	99.2	13.50
1977/78	76.7	6013.5	112.7	95.4	14.10
1978/79	83.0	6196.0	109.1	101.8	16.31
1979/80	91.4	6161.8	102.7	100.6	17.14
1980/81	100.0	6308.3	100.0	100.0	18.12
1981/82	110.4	6416.3	96.3	100.0	18.95
1982/83	123.1	6345.6	93.8	102.2	19.57
1983/84	131.6	6601.9	94.5	104.8	20.27
1984/85	137.2	6864.1	96.8	108.8	21.13
1985/86	148.7	6929.8	91.7	109.2	21.13

Source: ABS, Cat. No. 6401.0, 5206.0, 3201.0, 10.37, 8366.0, 8504.0
a – Consumer Price Index
Weighted average for eight capital cities 1980/81=100
b – household disp. inc. per cap. deflated by CPI
c – index of wine price deflated by CPI
d – index of beer price deflated by CPI
e – consumption per capita (litres)

RESULTS AND DISCUSSION

The static model

Static theory is often used as the basis for empirical demand functions. Models described as static are time independent models. Such models do not often adequately describe economic behaviour which is typically time dependent. Nevertheless, a static model is presented here as a basis for comparison with dynamic models or other studies. Such models are applied to describe the demand for wine in Australia.

The model referred to as **Model Ia** is written as a linear function as follows:

$$Q_t = \alpha + \beta_1 Y_t + \beta_2 WP_t + \beta_3 BP_t + \varepsilon_t \quad (1)$$

where

Q – yearly domestic retail sales of wine in Australia (litter/capita),

Y – yearly average household disposable income in real 1980 dollars (dollars/head),

WP – wine price – yearly index deflated by the consumer price index (CPI) – weighted average of eight capital cities for all commodity groups. Index 1980 = 100.

BP – beer price – yearly index deflated by CPI as for WP.

ε – an error term about which the usual requirements with respect to ordinary least squares (OLSQ) are assumed to hold,

t – a year subscript = 1 in 1955/56, ..., to 31 in 1985/86,

α and β – are regression coefficients.

The specified model was estimated as a single equation using the ordinary least squares method (OLSQ) and time series data. The linear functional form is commonly used as a basic model for similar studies, thus the estimates from a linear functional form were compared with other forms – linear-log, double-log and log-linear. The estimates from the four functional forms are in Table 2. In general, the estimates of the explanatory variables of any functional form could be considered to be reasonably satisfactory. The signs of the variables are in accord with the prior expectation. The results indicate that beer is a substitute for wine. This is reflected by the positive sign of the estimate for each of the functions, except for the result in the linear. The cross price elasticity of demand with respect to beer price is negative in this function. The result is similar to the estimates of the studies of George (1974), Clements and Johnson (1983) and Meagher et al. (1983). Although the signs of coefficients and the calculated elasticities are plausible (except for beer in linear function), the Durbin-Watson d-statistics from 0.62 to 0.80 indicate high positive serial correlation in the residuals.

The correlation of disturbances is a serious problem in econometric estimation using time series data. It violates one of the theoretical assumptions which underlie the ordinary least squares estimation. The assumption is that $E(\varepsilon_i, \varepsilon_j) = 0$ when $j \neq i$. When the OLSQ is applied to a model with a serial correlation in residuals there are three effects, described by Koutsoyiannis (1973) and Doran and Guise (1984):

1. There is a loss of efficiency, since the OLSQ implicitly assumes that residuals are independent, that is $E(\varepsilon_i, \varepsilon_j) = 0$.
2. If there is a positive serial correlation, as with the functions in Model Ia, than the standard errors of estimates are biased downwards, and estimate of $\bar{R}^2$ gives an overly optimistic impression of the worth of the model for prediction.
3. The values of the estimates, although statistically unbiased, are numerically wrong: they involve an error which may be important in small samples.

The estimates of parameters in the Model Ia are statistically highly significant but since DW statistics is low, one might obtain an overly optimistic impression of the model explanatory power. The previous discussion of auto-correlation suggests that specification of different model is necessary. A maximum-likelihood method (MLM) was applied to account for auto-correlation. The maximum-likelihood method, developed by Beach and McKinnon (1978), and widely cited in the literature – Maeshiro (1976), Chipman (1979), Park and Mitchel (1980) – tends to be better when samples are small (less than 100) than Cochrane-Orcutt method which loses the first observation and hence efficiency.

Table 2. The Estimates of Model Ia

Variable	Functional Form			
	Linear Q_t	Lin-log Q_t	Double log ln Q_t	Log-lin ln Q_t
C	−17.559	−179.381	−16.771	−0.474
	(−3.86)	(−9.46)	(−9.36)	(−1.12)
Y_t	0.00387	18.967	1.871	0.000386
	(22.44)	(23.71)	(24.78)	(24.05)
WP_t	−0.100	−14.104	−0.737	−0.00395
	(−8.80)	(−11.46)	(−6.34)	(−3.73)
BP_t	−0.197	20.637	1.427	0.012
	(−4.06)	(4.52)	(3.31)	(2.66)
R^2	0.978	0.980	0.980	0.978
$\bar{R}^2$	0.975	0.977	0.977	0.976
DW	0.69	0.80	0.68	0.62
SSR	19.055	17.556	0.156	0.165
SSR^*	0.219	0.201		
F	386.293	420.005	417.085	394.765
E_{ii}	−1.01	−1.33	−0.74	−0.47
E_{ij}	−1.83	1.95	1.43	1.19
E_{iy}	1.83	1.79	1.87	1.28

Q_t – is the annual consumption of wine per capita
SSR – is sum of squared residuals
SSR^* – is transformed SSR (Box and Cox transformation)
E_{ii} – own price elasticity of demand
E_{ij} – cross price elasticity of demand
E_{iy} – income elasticity of demand
The elasticities are calculated at mean values of consumption
The figures in parentheses are t-statistics

Since it has been said that the disturbances ε_t are serially correlated in Model Ia, it is assumed that

$$\nu_t = \varepsilon_t + \rho\varepsilon_{t-1} \qquad (2)$$

where ν_t is generated by a first Markov process with the usual properties of residuals, that is ν_t is not correlated with all previous ε_t's. ρ – is the auto-regressive parameter such that $-1 \geq \rho \leq 1$. If the same transformation process is used for each variable in Model Ia, one can obtain:

$$\begin{aligned} Q^*_t &= Q_t - \rho Q_{t-1} \\ Y^*_t &= Y_t - \rho Y_{t-1} \qquad (3) \\ WP^*_t &= WP_t - \rho WP_{t-1} \\ BP^*_t &= BP_t - \rho BP_{t-1} \end{aligned}$$

which is similar to Doran and Guise's (1984) suggestion:

$$Q_t = \alpha(1-\rho) + \beta_1 Y^*_t + \beta_2 WP^*_t + \beta_3 BP^*_t + \nu_t \qquad (4)$$

where variables are defined as in Model Ia; and the subscript $(_{t-1})$ represents the variables lagged one year. An additional consideration for the choice of the maximum likelihood procedure (MLM) was its superior performance when auto-regressive parameter is large. The conditions which would qualify the MLM from the use such as the use of weight in regression or gaps in the sample did not apply.

In the model specified here **(Model Ib),** the same data are used as in the Model Ia, but MLM procedure was applied, instead of OLSQ. As for Model Ia, the estimates of four functional forms are represented in Table 3. The signs of the coefficients of the estimated variables are 'correct' in each regression. It may be argued on the statistical ground that the linear and linear-log forms of functions are the most appropriate forms for the estimation of demand for wine (the estimated parameters of variables are statistically significant). However, the prediction of wine consumption by both functions is poor, as indicated by the coefficient of determination $\overline{R}^2$ and F-statistic. On the other hand, the F-statistics for the double-log and log-linear function are statistically significant, and the coefficients of determination $\overline{R}^2$ are appropriate for the time series data. Therefore, it seams that the linear-log and linear function are not appropriate to explain the variation of the dependent variable (consumption of wine). The Box and Cox (1964) l-statistic = 4.69 between linear-log and double-log function exceeds the critical (tabular $l_{(0.05)} = 3.84$) value, thus the null hypothesis is rejected at the 5 per cent level.[3] In this con-

Table 3. The Estimates of Model Ib

Variable	Functional Form			
	Linear Q_t	Lin–log Q_t	Double log $\ln Q_t$	Log–lin $\ln Q_t$
Rho	0.976	0.975	0.966	0.966
C	–3.527	–97.832	–8.879	0.803
	(–0.81)	(–3.94)	(–3.99)	(2.08)
Y_t	0.00267	12.554	1.275	0.000267
	(5.26)	(4.99)	(5.70)	(5.81)
WP_t	–0.062	–8.058	–0.513	–0.00358
	(–2.84)	(–3.16)	(–2.20)	(–1.77)
BP_t	0.077	8.668	0.584	0.00465
	(2.23)	(2.51)	(1.840)	(1.43)
R^2	0.24	0.18	0.59	0.61
$\overline{R}^2$	0.15	0.09	0.55	0.56
DW	1.08	1.223	1.217	1.11
SSR	7.185	7.752	0.065	0.063
SSR*	0.082	0.089		
F	2.540	1.819	11.777	12.445
E_{ii}	–0.62	–0.80	–0.51	–0.38
E_{ij}	0.72	0.82	0.58	0.46
E_{iy}	1.27	1.18	1.27	1.34

Q_t – is the annual consumption of wine per capita
SSR – is sum of squared residuals
*SSR** – is transformed SSR (Box and Cox)
E_{ii} – own price elasticity of demand
E_{ij} – cross price elasticity of demand
E_{iy} – income elasticity of demand
The elasticities are calculated at mean values of consumption
The figures in parentheses are t-statistics

[3] Besides desiding on the variable to include in the demand model, another problem in analysis is the choice of the most appropriate functional form. Chang (1977), Savin and White (1978) and Tsolakis et al. (1983a) devoted particular attention to the choice of functional form. Their work is based o studies by Box and Cox (1964) and Zarembka (1974), which employ the maximum likelihood method to estimate the parameters in the general form. In this study Box and Cox transformation procedure is used to derive a statistical test for comparison of linear and log functional forms. The null hypothesis is that two models are empirically equivalent.

The test ia based on the definition which Rao and Miller (1971) adopted $1 = \frac{N}{2}\left|\ln\left(\frac{\sum\varepsilon_1^2 / C^2}{\sum\varepsilon_2^2}\right)\right|$ (5)

where: N – is the sample size, $\sum\varepsilon_1^2$ – is the sum of the squared residuals (RSS_1) from the regrerssion with untransformed residuals (linear function), $\sum\varepsilon_2^2$ – is the sum of thesquared residuals (RSS_2) from regression with transformed residuals (logarithmic function), C – is the geometric mean of the dependent variable.
The l-statistics follows a chi-squared distribution with one degree of freedom. When the l-statistics exceeds the chosen (tabulated) critical value, the null hypothesis is rejected – hence the two functions tested are significantly different. Since the residual sums of squares after transformation in (5) are directly comparable, it is possible to choose the functional form yielding the minimum residual sum of squares as an empirically appropriate form.

text, the double-log function is more appropriate than the linear-log function, despite the higher significance of the *t*-statistics and the *d*-statistics of the later.

When the *d*-statistics is applied, the test *Ho*: $\rho = 0$, for the given sample size (30) and the number of regressors (3), yields a critical lower value of $d = 1.21$ and upper value $d = 1.65$. Since the critical value of the *d*-statistic is higher than estimated in the linear ($d = 1.08$) and log-linear ($d = 1.11$) functional form the *Ho* is rejected for those functions. The estimated value of the *d*-statistic for the linear-log ($d = 1.22$) and double-log ($d = 1.217$) function is slightly higher than the critical lower limit of the *d*-statistic for the sample. The test is inconclusive. The results suggest that the serial correlation in the residuals exists in the static model. However, serial correlation in residuals may exist if the model is misspecified, the relevant variable is omitted, or because of smoothing processes of seasonal variables (see Koutsoyiannis 1982).

Because economic considerations are important in the choice of model, these are considered now. The estimates of variables have the 'expected' signs in every functional form. The elasticities computed at the mean values appear not to be very sensitive to the choice of form. The estimates of demand elasticities in each functional form indicate that:

- demand for wine is price inelastic,
- beer is a substitute for wine,
- the income elasticity is higher than one (wine is a luxury good in Australia)

The elasticities in Model Ib are lower than in Model Ia and less sensitive to the choice of functional form. It may be argued that the estimates of parameters in Model Ia and Ib are overly optimistic, given the existence of serial correlation in the residuals. Therefore, it is concluded that Model Ia and similarly Model Ib are not appropriate for the estimation of the demand for wine in Australia, because the models are misspecified or relevant variables are omitted. It also appears likely , that the estimates in the previous studies by George, Owen and others, where beer was found to be complement to wine, and estimates of the elasticities were high, were the result of misspecification of the models or omission of relevant variables. One of the determinants of wine consumption identified in the statement of objectives is that the changes in the current consumption of the population is related to the previous consumption. So the next part of the study will continue by the estimation of the consumers' lagged reaction to the changes in prices and in incomes.

The long-term effect of income and prices

It was argued in previous part that a static model is not an adequate form for the estimation of demand for wine in Australia. On the theoretical grounds, it can be argued that the static model is too rigid in its adjustment to the changes in demand as Doran and Guise (1984) argue. To capture the dependence on time, it was necessary to develop a dynamic model. The introduction of dynamic aspects into the model means that consumers react with some delay to price and income changes, and that adjustment towards a new equilibrium does not occur immediately but over a period of time.

The reasons for the consumers lagged reaction, as Koyck (1954) argues, are imperfect knowledge of the market, and the psychological inertia of economic agents. A fall in price may not be known to every potential buyer immediately, in which case the full effect of the change in price will only be realised when every potential buyer is fully aware of the price cut. Psychological inertia prevents the instantaneous adjustment of the behaviour of economic agents to a changed situation, in that case habit leads to a lagged reaction. Once a consumer has found that a certain brand of wine satisfied his taste at given prices and qualities, he will probably not make the mental effort necessary to compare the various brands every time he buys wine.

A model of the form of Koyck's (1954) distributed lag model may be expressed as:

$$Q_t = \alpha + \beta_1 Q_{t-1} + \beta_2 Y_t + \beta_3 WP_t + \beta_4 BP_t + (\varepsilon_t - \lambda\varepsilon_{t-1}) \quad (6)$$

This was applied to approximate a dynamic approach to the demand for wine. The advantage of this approach is that it is possible to derive both short and long term elasticities.

The estimate of the **Model II** is presented in Tables 4 and 5. Following OLSQ estimation, the MLM was used to adjust for the problem of auto-correlation in the residuals where appropriate. There is still a violation of assumption of uncorrelated residuals in the model estimated by the OLSQ procedure. Thus, when the error terms are serially dependent, the estimates by ordinary least squares (OLSQ) are not the minimum/variance unbiased estimates of parameters. In fact, the features of the model are similar to the Model Ia:

1. Low Durbin-Watson *d*-statistics (0.65–1.41),
2. High coefficient of multiple determination R^2 (0.986–0.995),
3. High value og *F*-statistics (1 309–1 447),
4. High value of *t*-statistics (2.40–10.13).

Furthermore, the coefficient of beer price in the linear and the log-linear functional form is negative (that is beer is complement to wine), and statistically not significant. This is similar to the outcome in the Model Ia.

With the Koyck's geometric lag structure, two basic defects of distributed lag models are avoided. Since all lagged explanatory variables (X's) are replaced by a single variable Q_{t-1}:

- the maximum degrees of freedom are achieved,
- the extent of multi-colinearity is mitigated.

However, the lagged dependent variable among the explanatory variables has other undesirable consequences. First, in the new formulation the error term, $v_t = \varepsilon_t - \lambda\varepsilon_{t-1}$, is auto-correlated, if ε_t in the static model was serially independent. Secondly, the lagged dependent variable Q_{t-1} is not independent of error term v_t. Thirdly, auto-correla-

Table 4. The Estimates of Model II (OLSQ)

Variable	Functional Form			
	Linear	Lin–log	Double log	Log–lin
	IQ_t	Q_t	In Q_t	In Q_t
C	−1.269	−38.916	−3.515	−0.672
	(−0.48)	(−2.15)	(−2.06)	(−1.67)
Q_{t-1}	0.814	8.245	0.778	0.057)
	(10.13)	(9.08)	(9.06)	(4.60)
Y_t	0.00098	4.185	0.476	0.00018
	(3.32)	(2.50)	(3.01)	(3.99)
WP_t	−0.016	−7.320	−0.097	−0.0019
	(−0.168)	(−7.61)	(−1.07)	(−1.29)
BP_t	−0.0049	6.562	0.099	−0.0015
	(−0.17)	(2.40)	(0.38)	(−0.33)
R^2	0.996	0.995	0.995	0.988
$\bar{R}^2$	0.995	0.994	0.994	0.986
DW	1.41	1.12	1.26	0.65
h	1.83	2.84	2.29	4.75
SSR	3.734	4.086	0.036	0.089
SSR^*	0.043	0.047		
F	1447.01	1332.02	1309.70	531.23
E_{ii}	−0.17	−0.69	−0.10	−0.20
E_{ij}	−0.04	0.61	0.10	−0.15
E_{iy}	0.47	0.39	0.50	0.92
E^l_{ii}	−0.91	−5.75	−0.45	0.51
E^l_{ij}	−0.21	5.91	0.45	−0.38
E^l_{iy}	2.52	3.25	2.25	2.36

Q_t – is the annual consumption of wine per capita
SSR – is sum of squared residuals
SSR^* – is transformed SSR (Box and Cox)
E_{ii} – own price elasticity of demand
E_{iy} – income elasticity of demand
E^l – long–term elasticity of demand
The elasticities are calculated at mean values
The figures in parentheses are t– statistics

Table 5. The Estimates of Model II (MLM)

Variable	Functional Form			
	Linear	Lin–log	Double log	Log–lin
	Q_t	Q_t	In Q_t	In Q_t
Rho	0.408	0.468	0.451	0.834
C	−3.137	−47.643	−4.853	0.729
	(−1.21)	(−2.68)	(−2.83)	(2.59)
Q_{t-1}	0.708	7.639	0.678	0.042
	(7.81)	(7.63)	(7.04)	(3.69)
Y_t	0.00134	5.363	0.647	0.0002
	(3.81)	(2.82)	(3.54)	(4.37)
WP_t	−0.026	−7.439	−0.193	−0.00097
	(−2.27)	(−6.44)	(−1.73)	(−0.57)
BP_t	0.027	6.690	0.220	0.0014
	(0.97)	(2.61)	(0.88)	(0.48)
R^2	0.989	0.987	0.986	0.913
$\bar{R}^2$	0.987	0.985	0.984	0.899
DW	1.797	1.945	1.789	1.520
h	0.63	0.20	0.63	1.62
SSR	3.398	3.339	0.031	0.045
SSR^*	0.039[a]	0.038*		
F	562.10	459.34	442.46	62.90
E_{ii}	−0.27	−0.70	−0.19	−0.10
E_{ij}	0.25	0.63	0.22	0.14
E_{iy}	0.62	0.50	0.65	1.02
E^l_{ii}	−0.91	−3.84	−0.60	−0.18
E^l_{ij}	0.85	3.46	0.68	0.25
E^l_{iy}	2.12	2.74	2.01	1.85

Q_t – is the annual consumption of wine per capita
SSR – is sum of squared residuals
SSR^* – is transformed SSR (Box and Cox)
E_{ii} – own price elasticity of demand
E_{iy} – income elasticity of demand
E^l – long–term elasticity of demand
The elasticities are calculated at mean values
The figures in parentheses are t-statistics

tion of v_t, superimposed on values Q_{t-1}, renders the OLSQ estimates not only biased but also inconsistent in large samples, since $E(v_t, Q_{t-1}) = -\lambda\rho^2$, as Kmenta (1971) pointed out.

But, there are serially correlated residuals in the static model (Model Ia and Ib) and according to Hebden (1983, p. 30) that:

...if the original ε does show serial correlation (and it is very likely to do so, with time-series data), then the composite residual of the form seen in $(\varepsilon_t - \lambda\varepsilon_{t-1})$ may actually reduce this serial correlation, since the structure of the composite, $\varepsilon_t - (1-\lambda)\varepsilon_{t-1}$, is very similar to the composite that we artificially create when trying to remove serial correlation in the ε_t.

In fact, the equation (2) $v_t = \varepsilon_t - \rho\varepsilon_{t-1}$ is very similar to the error term in Koyck's model (6) $\varepsilon_t - (1-\lambda)\varepsilon_{t-1}$. Since rho and lambda are in the range (0,1), the composite residuals in Koyck's model will appropriate a correction of serial correlation. The appropriation is closer – the closer is $(1-\lambda)$ to the unknown serial correlation coefficient ρ. Because of that (similarity), it is possible to have a model with composite residuals $(\varepsilon_t - \lambda\varepsilon_{t-1})$ that removes serial correlation of residuals. In fact, serial correlation in the Model II is much lower than in the Model Ia with each functional form, as indicated by the Durbin-Watson test.

Application of the Durbin-Watson d-statistic was thought until 1986 to be inappropriate for a dynamic regression model (Malinvaud 1970, Kmenta 1971, Hebden 1983). A solution has been proposed by Inder (1986), who found that the DW d-test is generally more powerful and performs more consistently than do the large-sample asymptotic critical values of Durbin's h-test and t-test. In-

[a] In the derivation of the „h" statsitics in this and subsequent tables where appropriate the standard error of the lagged dependent variable (Q_{t-1}), S_{B1}, in linear-log and log-linear functions, is transformed through division by the geometric mea (See Appendix A).

der's approximation allows the use of DW tables of bounds and calculating critical values appropriate for a static model. DW tables are applied for k–1 variables in a dynamic model – the lagged dependent variable is omitted as regressor for the d-test.

Using Inder's approximation the DW statistics, in the model regressed by the OLSQ, indicates high serial correlation in the log-linear function $d = 0.65$, and for the linear log function $d = 1.12$. But DW estimates are inconclusive in the double-log $d = 1.26$ and for the linear function $d = 1.41$ for the k–1 regressor in the model the tabular $d_l = 1.21$ and $d_u = 1.65$. The Durbin's h-statistics indicates the existence of serial correlation in each functional form (2.29–4.75) except the linear form (1.83). This is consistent with the findings of Inder according to which the d-test is more appropriate than the h-test[4].

The estimates for the MLM are considered superior in that they represent demand function in more precise way than the estimates from the OLSQ procedure. Durbin-Watson estimates indicate that at the 5 percent level the null hypothesis is accepted for each function except the log-linear. With that function, the test is inconclusive ($d = 1.52$). Durbin's h-statistics (0.20–0.63) indicate similar findings, even for log-linear form (1.62). The comparison of the results between the dynamic models presented in Tables 4 and 5 and those of static models presented in Tables 2 and 3 reveals that the serial correlation of the residuals is remarkably lower in the dynamic models indicated by DW and h-statistics.

The conclusions with respect to serial correlation of residuals are similar to that of Nerlove and Addison (1958) who found positive serial correlation in static models, and no evidence of significant correlations of residuals in dynamic models of food consumption.

There still exists some level of the serial correlation in the residuals in the dynamic model (OLSQ), as DW and h-test indicate. Therefore, it is appropriate to test whether data used in the model are of the form of the serial correlation in the disturbances, or of the form of distributed lag. Griliches (1967) developed such a test of the distributed lag models. The null hypothesis that the data in the Model II are not serially correlated is accepted. The estimates of the Griliches model $Q_t = aX_t + bQ_{t-1} - abX_{t-1} + \varepsilon_t$ with data of wine consumption in this study indicate that the third coefficient ($-ab$) is not statistically significant and does not equal minus the product of the first (a) and the second (b) coefficients. That was estimated in the Model II. Thus this result suggests that the data in the Model II are not serially correlated but of the form of a distributed lag. Consequently, it is concluded that the model is of the form of a distributed lag, and it is appropriate to evaluate the demand for wine in Australia[5].

Since all the estimates of variables in the linear-log function are significant at the 5 per cent level, and since the d-statistics is the highest, if it is estimated by the maximum-likelihood method (MLM), the linear-log function is preferred as the most appropriate form to explain the demand for wine. The most significant improvements in the dynamic model are the changes in the estimated coefficients of the variables, and consequently more reliable estimates of the elasticities. The short term elasticities in Model II are comparable to those of Taplin and Ryan (1969).

From an economic point of view, an essential feature of the Model II, in comparison to the Model I, is that it captures the dynamic effect of the variables on consumption. The Model I reflects any changes in prices and income as an instantaneous and complete response in consumption. This is an exercise in comparative statistics. However, it is far more realistic to assume that a change in prices and incomes induces changes in consumption, which may continue for many time periods. One reason for this is that habitual consumption patterns do not change quickly.

The model that enables to capture a dynamic effect in consumption is the Model II. The existence of the long run multiplier, as Koyck (1954) and Nerlove and Addison (1958) argue, makes it possible to calculate the long run elasticities. The long run multiplier may be expressed as $\beta_2/(1 - \beta_1)$, where β_1 is the coefficient of the lagged dependent variable (consumption) and β_2 is the coefficient of the relevant other explanatory variable in a model. The multiplier gives the total response to the change in price of wine, beer or income after all adjustments having taken place. The coefficient β_1 is related to the speed of adjustment; if it is close to zero, the dynamic model is quite similar to the static model. On the other hand, if β_1 is large, the adjustment takes place slowly, and a static model is not appropriate.

In the Model II, the estimate of the β_1 coefficient is large (between 0.68 and 0.72), with highly significant t-ratios (7.04 to 7.64). This implies that $\bar{R}^2$ coefficient must have risen. Indeed the $\bar{R}^2$ has risen to around 0.98 from 0.15 and 0.55 in Model I. This result indicates that the lagged consumption of wine is relevant variable in the model of demand for wine. Then it may be argued that static model is misspecified and the coefficients of explanatory variables in that model are biased.

The bias is given by the $\beta_1 * \beta_{12}$ term, if

$$E(\hat{\beta}_2) = \beta_2 + \beta_1 \frac{\sum X_1 X_2}{\sum X_2^2} \qquad (7)$$

where

$E(\hat{\beta}_2)$ – is the estimate of β_2,

β_1 – is the coefficient of the lagged dependent variable X_1,

β_2 – is the coefficient of another explanatory variable X_2,

$\beta_1 * \beta_2$ – is equal to the second term on the right hand sight of the equation (7).

If neither β_1 nor $\sum X_1 X_2 / \sum X_2^2$ are zero, the omission of the relevant variable X_1 (lagged con-sumption) would result in parameter estimate of the variable X_2 being biased. Lagged consumption is positively correlated to other variables except the price of wine in the Model II.

[5] See Appendix B

Thus, income and prices are positively biased if lagged consumption is omitted from the model. In practice, the coefficient of the income and price variables decreased in the Model II in comparison to the Model I.

It may be argued that the estimates of the variables and thus the elasticities in the static model (Model I) are higher than they ought to be (the estimates of OLSQ in linear-log function are $E_{ii} = -1.33$, $E_{ij} = 1.95$ and $E_{iy} = 1.79$). Such estimates represent not only the short run elasticities but some mixture of the short and the long run elasticities. Hence, the estimates of the demand elasticities may be expected to be lower in the Model II than in the previous models. In fact (See Tables 4 and 5), the elasticities are much lower (the estimates of MLM in linear-log function in the short term are $E_{ii} = -0.70$, $E_{ij} = 0.63$, $E_{iy} = 0.50$). The largest difference is in the income elasticity, as would be expected from the high correlation coefficient between lagged consumption and income.

It is clear, then, that all criteria point to lagged consumption as a worthwhile addition to the model and, consequently, that the dynamic model allowing for gradual adjustment is more appropriate for the estimation of wine consumption than a static model.

Finally, since the error terms are serially dependent in the model, if it is estimated by ordinary least squares, the estimates are biased. However, serially correlated residuals exist if a model is misspecified, a relevant variable is omitted or because of the smoothing process of seasonal variables. The market relationship explaining wine consumption is thus more complex than a simple static relation between consumption, prices and income.

The presence of bias in the static model and better performance of dynamic models indicate dynamism and habit in wine consumption. Accepting the result of regression of the dynamic models, we must emphasise that the previous consumption (lagged dependent variable) is statistically significant, therefore the second null hypothesis is rejected; the current consumption is related to the previous consumption. There is an adjustment process and a gap between the short and long-run price and income elasticities of demand.

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Arrived on 23th March 2000

[6]The Appendix A was not the part of the thesis.

Appendix A

THE DURBIN-WATSON *d*-TEST AND THE DURBIN *h*-TEST WHEN THE REGRESSORS INCLUDE LAGGED DEPENDENT VARIABLES[6]

Application of the Durbin-Watson (DW) *d*-statistic was thought until the end of 1980's to be inappropriate to dynamic regression models (Malinwaud 1970, Kmenta 1971, Hebden 1983). A solution was proposed by Inder (1986), who found that the DW *d*-statistic is generally more powerful and performs more consistently than do the large-sample asymptotic critical values of Durbin's *h*-test and *t*-test.

The Durbin-Watson *d*-test is derived by the assumption that the regressors $X_{1t}, X_{2t}, \ldots X_{kt}$ are fixed in repeated samples, as Doran and Guise (1984) argue. However, if some (or all) of the regresors are lagged dependent variables, the assumption is violated; as it was assumed before Inder (1986).

In such cases, Durbin (1970) suggested to apply the *h*-statistic defined as

$$H = (1 - 1/2d)\left[\frac{N}{(1 - NS^2_{\hat{\beta}_1})}\right]^{1/2} \qquad (1A)$$

where

d – is the ordinary Durbin-Watson statistic,

$S_{\hat{\beta}_1}$ – is the standard error of β_1, the coefficient of lagged dependent variable Q_{t-1},

N – is the sample size.

Durbin has shown that under the null hypothesis, when RHO $\rho = 0$, the *h*-statistic has the appropriate standard normal distribution. Thus, at the 95 per cent level of significance the null hypothesis H_0: $\rho = 0$ would be rejected if $|h| > 1.96$. However, it sometimes happens that $NS^2_{\hat{\beta}_1} \geq 1$, and the *h*-statistic is then not defined.

It has been found in this study (Model II) that the estimates of *h*-statistic in linear and double-log functions (Table 5) are comparable to DW *d*-statistic (Inder's 1986 finding for models with lagged dependent variables). However, the estimate of *h*-statistic in the linear-log function is not defined. That problem in linear-log function arises since $S_{\hat{\beta}_1}$ for the lagged dependent variable is around one (Model II, MLM), compared with 0.09–0.1 in the double-log and linear functions (See Table 1A). Such results suggest that $S_{\hat{\beta}_1}$ is not comparable between different functions.

The definition of $S_{\hat{\beta}_1}$ is as

$$S_{\hat{\beta}_1} = \left[\frac{\sigma^2}{\sum x_i^2}\right]^{1/2} \qquad (2A)$$

where $\hat{\sigma}^2$ is defined as

$$\hat{\sigma}^2 = \frac{1}{\nu}\sum_{i=1}^{N} e_i^2 \qquad (3A)$$

or $$\hat{\sigma}^2 = \frac{1}{\nu}\sum y_i^2 - \hat{\beta}_1 \sum x_i y_i \qquad (4A)$$

where

ν – is degrees of freedom,

N – is a sample size,

x – is the independent variable (regressor),

y – is the dependent variable,

$\hat{\beta}_1$ – is the estimate of the coefficient for independent (regressor) variable.

The $\hat{\beta}_1$ is defined as:

$$\hat{\beta}_1 = \frac{\sum x_i y_i}{\sum x_i^2} \qquad (5A)$$

From the definition of the variables in linear and double-log function, it is clear that "*y*" (or *Q* in equations in the study) as the dependent variable, and "*x*" as independent variable are measurable in the same units. However, "y" is in different units to "*x*" in the linear-log function, since "*y*" is measurable in linear units, and "*x*" in logarithms. The reverse applies to the log-linear function.

From the theory, if the data are divided or multiplied by some constant, then the values of the mean and variance are changed. Since the $\hat{\beta}_1$ is defined in linear units for the linear-log function, and in logarithms for the double-log function, the difference is the antilog of "*y*". The same problem arises in the comparisons of the variances $\hat{\sigma}^2$ and standard errors $S_{\hat{\beta}_1}$ for the different functional form.

A similar problem arises in the test derived by the Box and Cox (1964) to compare different functional forms. The test is the *l*-statistic as in (5 of the article):

$$l = \frac{N}{2}\left|\ln\left(\frac{\sum \varepsilon_1^2 / C^2}{\sum \varepsilon_2^2}\right)\right| \qquad (6A)$$

where:

N – is the sample size,

$\sum \varepsilon_1^2$ – is the sum of the squared residuals (RSS_1) from the regression with untransformed residuals,

$\sum \varepsilon_2^2$ – is the sum of the squared residuals (RSS_2) from regression with transformed residuals,

C – is the geometric mean of the dependent variable.

The problem in the estimation of the standard error $S_{\hat{\beta}_1}$, the variance $\hat{\sigma}^2$ and the estimate of the coefficient of lagged dependent variable in different functional form of the regression is the same as in the estimation of the *l*-statistic; logarithm versus linear units. Then the appropriate transformation coefficient is the same as for the *h*-statistic – the geometric mean. The only difference is the power of the constant, since the RSS are calculated to the power two, and the estimates of the standard error

and the coefficient of lagged dependent variable β_1 is calculated in linear units. Therefore, the transformation coefficient for the standard error must be in linear units as well.

The application of the transformation procedure might be in the form of:

For the linear-log function, the transformed standard error of the lagged dependent variable is:

$$TS_{\hat{\beta}_1} = \frac{S_{\hat{\beta}_1}}{C} \qquad (7A)$$

and for the log-linear function:

$$TS_{\hat{\beta}_1} = S_{\hat{\beta}_1} * C \qquad (8A)$$

where

$S_{\hat{\beta}_1}$ – is the standard error of the lagged dependent variable from the regression,

C – is the geometric mean of the dependent variable.

Example:

In the Model II estimated by the maximum likelihood method (MLM), was transformed as:

Table 1A. Transformed standard error

Functional Form	$S_{\hat{\beta}_1}$	$TS_{\hat{\beta}_1}$
Double–log	0.0963230	–
Linear	0.0906446	–
Linear–log	1.0013740	0.1072667
Log–linear	0.0115119	0.1074678

For the calculation of transformed standard errors, there were applied the equations (7A) and (8A). The value of the h-statistic calculated by this procedure is with the Model II in Table 4 and 5 of the article. It was found that the value of $NS_{\hat{\beta}_1}$ was less than one, therefore the *h*-statistic could be defined.

In the conclusion, it has been found out that the h-statistic for the **log-linear function** can be defined all the time, since the standard error of lag dependent variable must be always very small. Thus no one would realise that there is a problem with the definition and calculation of the standard error $S_{\hat{\beta}_1}$ of lag dependent variable for the log-linear functional form.

Appendix B

TEST OF DISTRIBUTED LAG MODELS – GRILICHES

There is, as Griliches (1967) pointed out, a number of implications involved in testing the validity of "dynamic" models involving lags. The tests developed by him were aimed at discovering:

1. whether the results are from an adjustment model and not from a serial correlation in the true disturbance (due to misspecification of the model), and
2. the appropriate specification when expectation are formed adaptively or there are lags describable by a partial adjustment model and the conditions necessary in the lag structure for an appropriate choice of model to be made.

Griliches (1967) developed a test for test serially correlated disturbances. If the true model is not of the form of a distributed lag, but just a regular relation between contemporaneous variables as

$$Q_t = aY_t + u_t \qquad (1B)$$

with serially correlated residuals

$$u_t = u_{t-1} + e_t \qquad (2B)$$

then the actual model estimated will be

$$Q_t = aY_t + bQ_{t-1} + v_t \qquad (3B)$$

As Griliches points out:

'The introduction of the irrelevant Q_{t-1} variable into the estimating equation usually gets significant and sensible coefficients, and the serial correlation of the estimated residuals is reduced. Such a partial adjustment model works even though it is wrong'.

Griliches (1967) and Koutsoyiannis (1973) argue that a Durbin-Watson *d*-statistic in this context as a test for serial correlation in the original disturbances is very badly biased.

The following model was applied by Griliches to test serial correlation

$$Q_t = aY_t + bQ_{t-1} - abY_{t-1} + \varepsilon_t \qquad (4B)$$

If the coefficient of Y_{t-1} is negative and significant, when added to the partial adjustment model, and approximately equal to $(-ab)$ minus the product of the first two coefficients in the equation, it is concluded that the addition of the Q_{t-1} variable to the original model (equation 1B here in appendix) was in error. Thus, an alternative hypothesis is considered – that the result is not due to the data of the distributed lag form in the adjustment model (equation 3B), but due to the serial correlation in the disturbances (due to omitted variables or the misspecifications of theoriginal model – equation (1B)).

The estimate of the coefficient of lagged income, Y_{t-1}, is not significant, and it is not approximately equal to minus the product of the first two variables in the models with the yearly data. And the value of *t*-statistics 0.325 and 0.731 with OLSQ and MLM procedures indicate that variable Y_{t-1} has no statistically significant effect on the dependant variable.

The product of the first two coefficient is:

a. LSQ procedure = 0.000795 × 0.913 = 0.000726

b. MLM procedure = 0.00106 × 0.90 = 0.000954

The third coefficient (Y_{t-1}) of the equation (4B) does not equal minus the product of the firsts two coefficients

(Table 1B). It may be concluded that the hypothesis of serial correlation is rejected and the distributed lag model is accepted for the regression with yearly data.

Griliches suggests that the serial correlation model can be accepted as a true model if all three conditions are fulfilled. In our case, the coefficient of the lagged income variable Y_{t-1} should be:

1. negative
2. statistically significant,
3. approximately equal to – ab minus the product of the first two coefficient in the model.

The validity of Griliches conclusions may be tested by comparing them with those of another test of Rao and Miller (1971). They formulated a test for serial correlation models in the form of:

$$\Theta = \frac{ab}{a+ab} + \frac{b}{1-b} \qquad (5B)$$

where

Θ – is the average lag of the time profile,

a – is the coefficient of the independent variable Y_t,

b – is the coefficient of the lagged dependent variable Q_{t-1},

ab – is the coefficient of the lagged independent variable Y_{t-1}.

Table1B. The Estimates of Griliches, Model

Variable	Yearly Data	
	OLSQ	MLM
	Q_t	Q_t
C	−1.600	−1.680
	(−2.94)	(−2.39)
Y_t	0.00079	0.00106
	(1.34)	(1.92)
Q_{t-1}	0.913	0.904
	(21.12)	(16.29)
Y_{t-1}	−0.00021	−0.00045
	(−0.33)	(−0.73)

Q_t – is the annual wine consumption per capita
Y_t – is income per capita

As exposited in Rao and Miller, if the equation was generated by a serial correlation model, rather than by a distributed lag model, the average lag of the time profile Θ will be zero. In such a case equation (3B) yields a time profile because of the omitted variable ($\Theta \neq 0$), but in equation (4B) Θ does equal zero. Therefore, the equation (3B) may be viewed as a misspecified of (4B) in which the variable Y_{t-1} is left out.

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The dynamics of crop production in Slovenia

Dynamika rostlinné výroby ve Slovinsku

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Abstract: This paper investigates patterns in production, purchased production through different marketing channels, the dynamic in yields and in area harvested by main crops (for wheat, maize, sugar beets, and potatoes), by institutional sector (private and the former "social" sector), and over time (1965–1998). The main focus of this study is on the dynamics in main crop production by using a regression analysis. The supply response model for Slovenian crop products is estimated. Area harvested in the current period is used as dependent variable, while farm-gate price in the previous period (the output price deflated by the index of crop prices), yield per ha in the previous period, area harvested in the previous period, and time trend are used as explanatory variables. The coefficients of short-term elasticity of supply are less than the coefficients of long-term elasticity, and therefore these results imply a greater long-term reaction by farmers.

Keywords: crop production, elasticity of supply, Slovenia

Abstrakt: Práce se zabývá vzorci výrobního procesu, produkce nakoupené prostřednictvím různých marketingových kanálů, dynamikou vývoje hektarových výnosů a sklizňových ploch hlavních plodin (pšenice, kukuřice, cukrovky a brambor) v jednotlivých institucionálních sektorech (soukromý sektor a bývalý „socialistický" sektor) a v časovém vývoji (v letech 1965–1998). Studie je zaměřena především na dynamiku hlavních odvětví rostlinné výroby s využitím regresní analýzy. Je zde navržen model reakce nabídky pro slovinské rostlinné produkty. Jako závislé proměnné byly použity sklizňové plochy běžného období, zatímco farmářské ceny předchozího období (cena tržní produkce deflovaná indexem cen produkce), hektarové výnosy předchozího období, sklizňové plocha předchozího období a časový trend jsou užity jako explanatorní proměnné. Koeficienty krátkodobé elasticity nabídky jsou nižší než koeficienty dlouhodobé elasticity a výsledky tudíž implikují vyšší dlouhodobou reakci zemědělských producentů.

Klíčová slova: rostlinná produkce, elasticita nabídky, Slovinsko

INTRODUCTION

Slovenian agriculture differs from that in most Central European countries (CEC) in transition in many aspects. Firstly, the process of collectivisation was abandoned (as in Poland and the rest of former Yugoslavia) and bi-polar agriculture, the state (in the former Yugoslavia called "social" sector) versus the private sector, primarily based on traditional private ownership and operation, dominated.[1] Bi-modal farm structure development was typical, with a few large-scale "social" farms on one side and mostly small-scale private farms on the other. There were also agricultural co-operatives, which provided services for private farmers. Secondly, private farms are established on a small-scale and are mostly part-time in their economic orientation. Part-time farming with the division of farmers' time between farming and off-farm work is of vital importance. The proportion of farmers in Slovenia who work off the farm is quite high, being over 60% (Kovacic 1995). The transition process did not involve particularly dramatic changes in farm structure. Private small-scale and part-time farms are dominant in agriculture. Thirdly, agriculture is viewed as a sensitive sector due to the traditional role it plays for rural communities. Slovenia's topography consists primarily of hilly (up to 500 meters altitude) and mountainous areas, where private farming has traditionally played a significant role in the decentralised development of these regions, and in household home consumption.

The focus of this paper is on the dynamics in main crop production by using a regression analysis. In the rest of the paper, patterns in production, purchased production through state and co-operative marketing channels, the dynamic in yields and in area harvested by main crops (for wheat, maize, sugar beets, and potatoes), by institutional sector (private and the former "social" sector), and over time, are investigated.

[1]Wherever in this paper the reference is made to the private sector farm, this refers to the historically individual family farm, and wherever the reference is made to the "social" sector farm, this refers to the privatised, former "social" sector farm.

DYNAMICS OF CROP PRODUCTION

Private sector farms traditionally produced the major part of *wheat* production. Wheat was largely produced for the subsistence needs of farm households for both human consumption and for livestock feed. The increase in wheat production during the 1980s largely occurred due to an increase in wheat production in the "social" sector farms (See figure 1). During the 1980s , wheat production in "social" sector farms almost doubled, while in private sector farms it explored cyclical fluctuations. It seems that the peak in wheat production was achieved at the beginning of the 1990s. In the mid-1990s, about one-third of wheat production was produced by "social" sector farms and about two-thirds by private sector farms.

An increase in *maize* production for both private and "social" sector farms was reported up to the beginning of the 1990s (figure 2). However, private sector farms traditionally produced the majority of maize. In addition, the private sector farms traditionally produced a substantial amount of maize as feed for cattle and dairy cows. In 1992 and 1993, maize production sharply declined, largely as a result of adverse weather conditions (drought). Afterwards, maize production recovered, especially in the private sector farms.

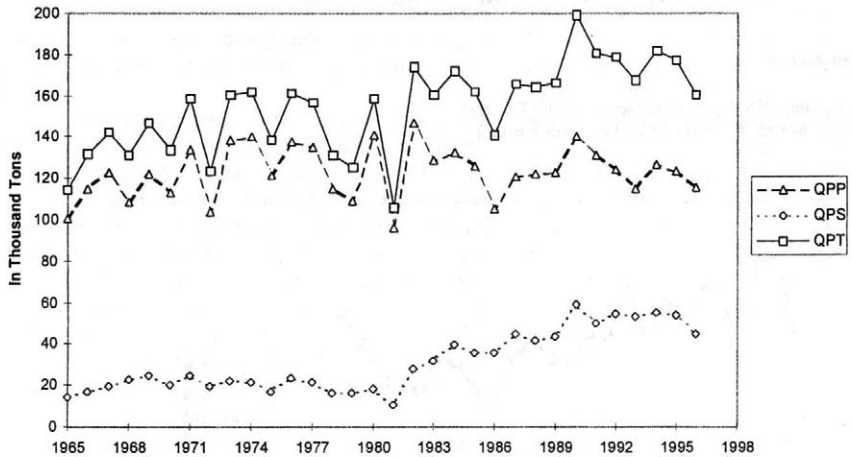

Figure 1. Wheat production

Note: QPP = in private sector, QPS = in "social" sector and QPT = total
Source: Compiled by the author on the basis of Statistical Yearbook of Slovenia (SY SLO) [various issues]

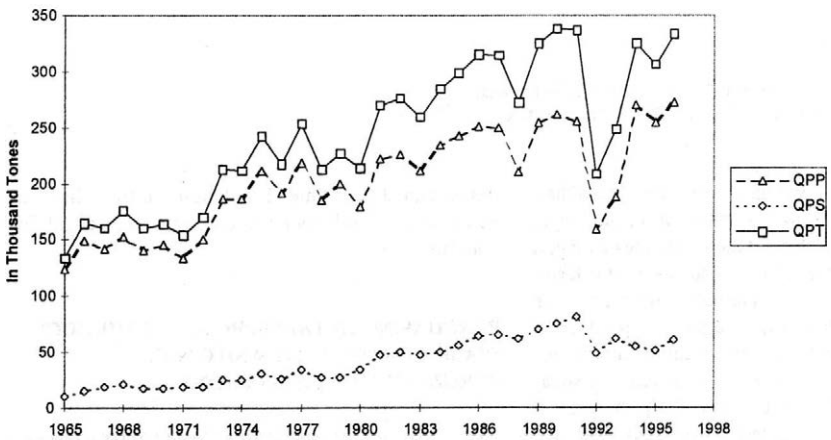

Figure 2. Maize production

Note: QPP = in private sector, QPS = in "social" sector and QPT = total
Source: Compiled by the author on the basis of SY SLO [various issues]

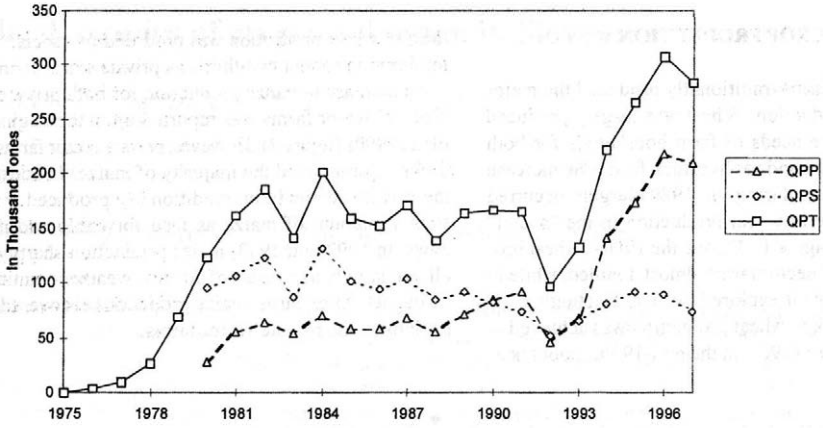

Figure 3. Sugar beet production

Note: QPP = in private sector, QPS = in "social" sector and QPT = total
Source: Compiled by the author on the basis of SY SLO [various issues]

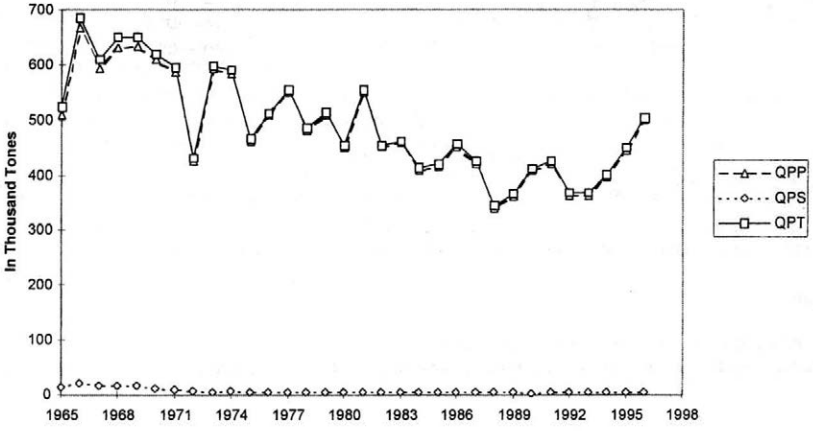

Figure 4. Potato production

Note: QPP = in private sector, QPS = in "social" sector and QPT = total
Source: Compiled by the author on the basis of SY SLO [various issues]

Sugar beet production was initiated in the second half of the 1970s by the setting up of the Slovenian sugar refinery. Prior to the beginning of the 1990s, the major part of sugar beet was produced by the "social" sector farms (figure 3). This production was largely supported by the state. As for some other crops, sugar beet production declined in 1992 due to the adverse weather conditions. Afterwards, it sharply increased. This increase in sugar beet production was largely due to a sharp increase in production in the private sector farms. In the mid-1990s, the private sector farms produced the major part of sugar beet.

Excepting seed potatoes, almost all *potato* production was in private sector farms (See figure 4). Potato production declined over time. This long-term trend in reduction of potato production was connected to cyclical fluctuations.

PURCHASING OF FARM PRODUCTS THROUGH STATE, CO-OPERATIVE AND OTHER PURCHASING ORGANISATIONS

Differences were found in purchasing of farm products by commodity and by ownership of farms and over time. "General agricultural service co-operatives" were the main marketing outlet for private farms and input and

output markets. Prior to the 1990s, private farmers signed contracts for "organised production and delivery" which stimulated their production (by the implementation of input subsidies and credits). Also, "general agricultural service co-operatives" purchased products from private farmers without contractual relations. As for alternative marketing channels, there were a few free markets for piglets and also a few free markets for produce (e.g., potatoes and apples), and, in towns, for fruit, potatoes, vegetables, and other agricultural products which farmers sold directly to consumers at market prices. Thus, the delivery of agricultural inputs to private farmers and the purchase of most crops, grapes, milk, and livestock produced by private farmers were in the hands of the "general agricultural service co-operatives" (which then sold their output to processors and wholesalers). Also, private farmers were partly selling directly to the food processing industries and purchasing organisations in the "social" sector.

Directly purchased *wheat* by the "general agricultural service co-operatives" and state organisations sharply increased in the 1980s (figure 5). Prior to the 1980s, almost all wheat in private sector farms was produced for the subsistence needs of farm households for human and animal consumption. Later on, private sector farms started selling wheat directly to the "general agricultural service co-operatives" and to state purchasing organ/isations. The purchased quantities of wheat oscillated as revealed by the fluctuations in production as well as by changes in purchasing conditions. The ratio of directly sold wheat to produced wheat was rather low in private sector farms. A substantial amount of wheat produced by private sector farms was consumed within farm households. During the 1990s, the directly marketed share of wheat from private sector farms increased. Until 1996, the quantities of directly purchased wheat from the "social" sector farms were at least as large as from the private sector farms. Almost all produced wheat at the "social" sector farms was directly sold to state purchasing and milling organisations.

Private and "social" sector farms differed even more in *maize* production. Private sector farms produced most maize, while most maize purchases were made by state purchasing organisations from the "social" sector farms (figure 6). This could be explained by two factors. First, private sector farms produced maize largely for livestock feed (e.g., silage). It was a rule in the past, that farm households had two to three cows producing milk for home consumption while any surpluses were sold. In addition, farm households held some cattle and pigs, and maize, together with potatoes and wheat, represented the most important livestock feed. Second, the state purchasing agencies were largely buying maize from former "social" farms, and there was no alternative purchasing channel for maize from the private sector farms.

No substantial difference was found between *sugar beet* production and purchased sugar beet (figures 3 and 7). This indicates that the sugar refinery directly purchased almost all sugar beet production. Initially, the former "social" sector farms produced the major part of sugar beet. Then private sector farms gradually increased sugar beet production, hence a substantial increases in production and in purchased sugar beet from private sector farms has been reported since 1993. In 1997, almost 74% of sugar beet production and 73% of purchased sugar beet were from private sector farms.

Private sector farms (figure 8) delivered the major part of potatoes purchased. There was a decline in the amount of directly purchased potatoes over time. Only a part of potato production was directly purchased, while a large amount was directly used on farm households for human consumption and for feeding of pigs as well as direct sales to consumers. In the latter case, some large users such as restaurants and hotels started buying potatoes

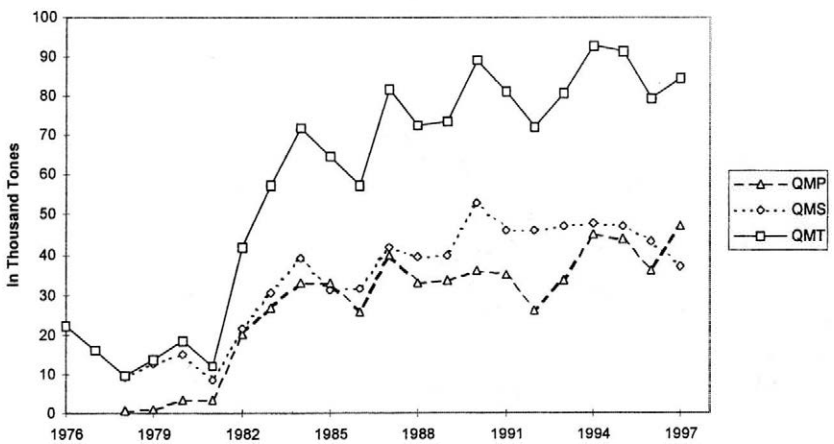

Figure 5. Purchased wheat

Note: QMP = from private sector, QMS = from "social" sector and QMT = total
Source: Compiled by the author on the basis of SY SLO [various issues]

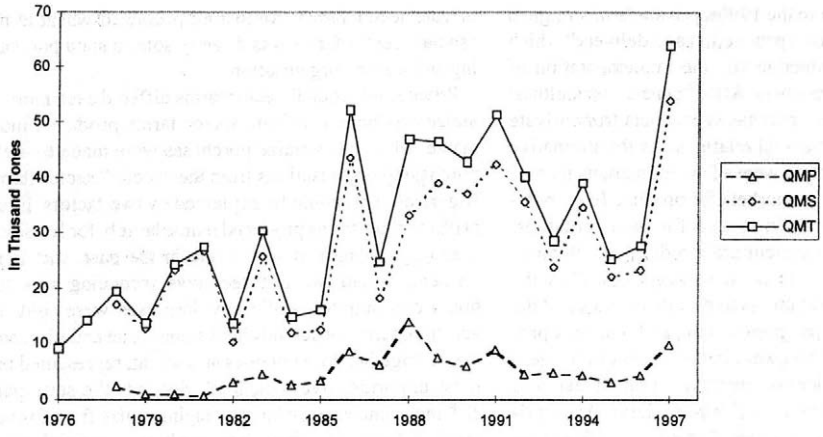

Figure 6. Purchased maize

Note: QMP = from private sector, QMS = from "social" sector and QMT = total
Source: Compiled by the author on the basis of SY SLO [various issues]

directly from farmers. This development and the related transactions were often omitted in the statistical reports on purchased potatoes. Also, it seems that production of potatoes was overestimated in the past because there was likely to be less area sown in potatoes than was reported by statistics.

LEVEL AND DYNAMICS OF YIELDS

Yield or production per ha in the "social" sector farms was in average higher than in the private sector farms (figures 9 to 12). This was largely due to more intensive use of fertilisers/chemicals and because crop production in the "social" sector farms is often located on the best soils of Slovenia. While there was not so large a difference in yields among former "social" sector farms, the differences in yields between individual, private sector farms are still large. This wide variability in yields in private farms is an additional reason explaining why the average yield per ha in private sector farms is lower than in the "social" sector farms. Finally, the former "social" sector farms devoted much more attention to technical efficiency in production with higher yields as an objec-

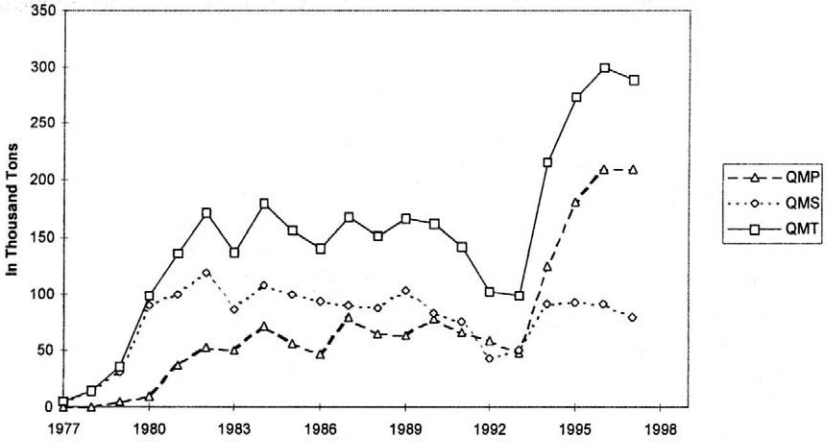

Figure 7. Purchased sugar beet

Note: QMP = from private sector, QMS = from "social" sector and QMT = total
Source: Compiled by the author on the basis of SY SLO [various issues]

tive *per se*, which was sometimes considered an even more important objective than economic efficiency of farming.

Yields in *wheat* production increased in both private and the former "social" sector farms. Yields in the former "social" sector farms were higher than in private sector farms. During the 1990s, wheat yields declined in the former "social" sector farms. In 1992 and 1993, they also slightly declined in private farms due to adverse weather conditions. However, the difference in yields between the former "social" farms and the private farms reduced during the 1990s.

Yields in *maize* production also increased. However, a sharp drop in yields in 1992 and 1993 occurred largely due to adverse weather conditions. As for wheat, yields in the former "social" sector farms were higher than in the private sector farms.

Yields in *sugar beet* production were higher in the mid-1970s than at the beginning of the 1980s, but no substantial difference was reported in yields between the former

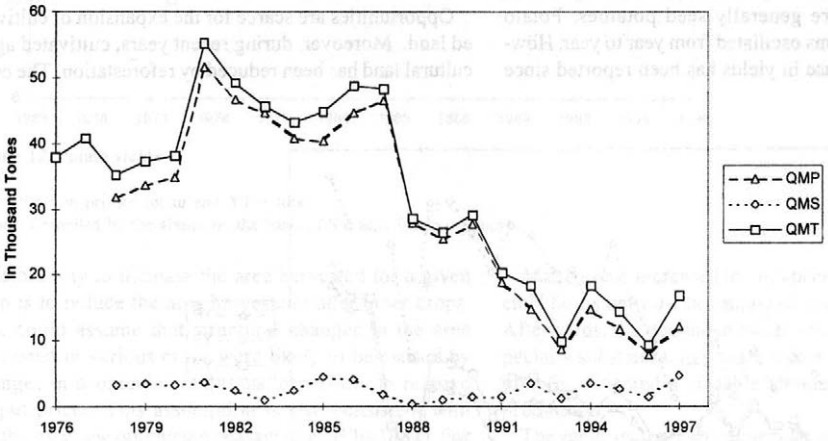

Figure 8. Purchased potatoes

Note: QMP = from private sector, QMS = from "social" sector and QMT = total
Source: Compiled by the author on the basis of SY SLO [various issues]

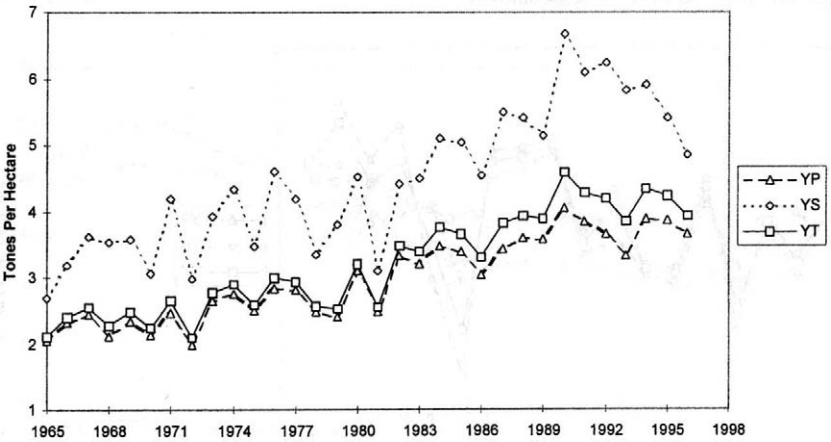

Figure 9. Wheat yields

Note: YP = in private sector, YS = in "social" sector and YT = total
Source: Compiled by the author on the basis of SY SLO [various issues]

"social" and private sector farms. In some years, yields in private sector farms were higher than in "social" sector farms. Private farms did not largely produce sugar beet, so yields were much more equally distributed across farms than for wheat and maize production. Yet sugar beet was mostly produced by those farms that saw profit opportunities in the newly introduced crop. The drop in sugar beet yields in 1992 and 1993 largely occurred due to adverse weather conditions, but later yields, especially on the private sector farms, recovered substantially.

The small quantities of *potatoes* produced by former "social" farms were generally seed potatoes. Potato yields in private farms oscillated from year to year. However, a sharp increase in yields has been reported since 1993. Unlike many other CEECs, where yields during the previous system were often overestimated (e.g., Jackson and Swinnen 1995), yields in potato production in Slovenia were likely to be underestimated. More specifically, the reported sharp increase in yields while production remained stable and a substantial reduction of area harvested is reported may be biased by changes in the statistical methodology (OECD 1998).

CHANGES IN AREA HARVESTED

Opportunities are scarce for the expansion of cultivated land. Moreover, during recent years, cultivated agricultural land has been reduced by reforestation. The only

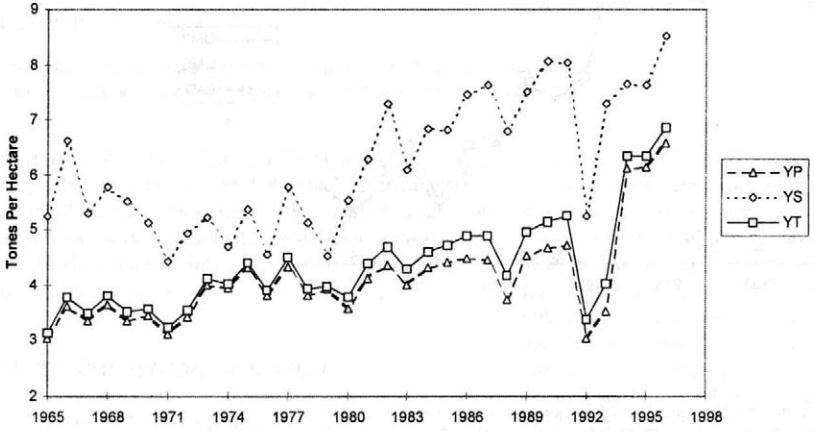

Figure 10. Maize yields

Note: YP = in private sector, YS = in "social" sector and YT = total
Source: Compiled by the author on the basis of SY SLO [various issues]

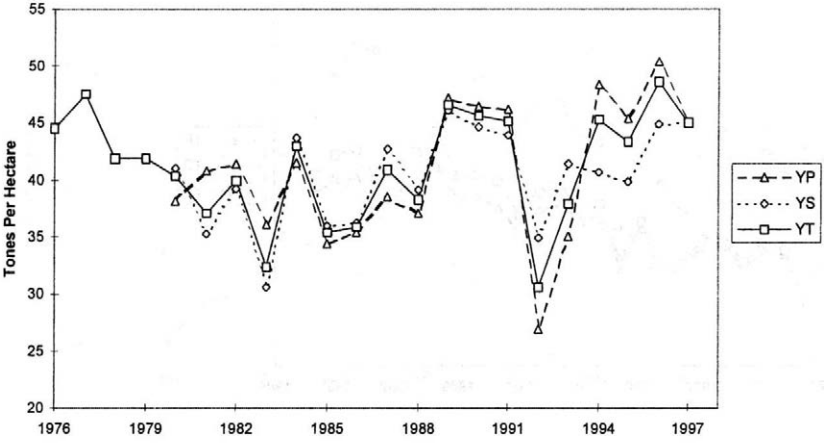

Figure 11. Sugar beet yields

Note: YP = in private sector, YS = in "social" sector and YT = total
Source: Compiled by the author on the basis of SY SLO [various issues]

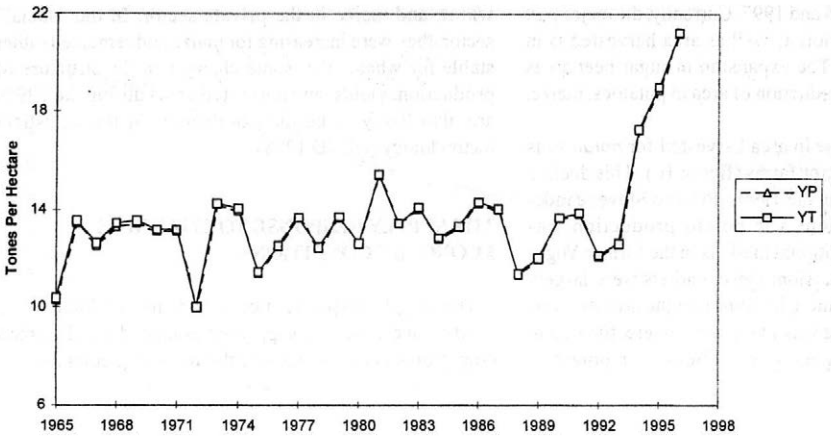

Figure 12. Potato yields

Note: YP = in private sector and YT = total
Source: Compiled by the author on the basis of SY SLO [various issues]

possible way to increase the area harvested for a given crop is to reduce the area harvested under other crops. One could assume that structural changes in the area harvested in various crops were likely to be caused by changes in economic conditions, especially in relative output prices. This assumption is also consistent with the theory of the optimising peasant (e.g., Ellis 1987). For some crops, there are also opportunities for a second harvest at least during a two-year period (e.g., silage maize following barley, wheat, or early potatoes).

Harvested *wheat areas* slightly increased until the beginning of the 1970s, but afterwards declined (figure 13). This was especially significant in the private sector. A drop in wheat area harvested at the beginning of the 1980s was caused by substitution of maize and sugar beet for wheat.

Maize areas increased in both private and former "social" farms until the beginning of the 1990s (figure 14). Afterwards, the decline in maize area harvested was especially substantial in private sector farms, which traditionally allocated a sizeable amount of land to maize production.

The rapid increase in *sugar beet area* harvested from less than 1,000 ha in 1978 to more than 7,000 ha in 1998 is of a special interest (figure 15). At the beginning of the 1980s, about one-third of the area harvested was in private sector farms and about two-thirds in "social" sector farms. Afterwards, the area harvested slightly increased in private sector farms. In 1992 it declined, but afterwards sharply increased. In the "social" sector farms, sugar beet areas stabilised in the period 1981–1984, but declined afterwards until 1992. Then they increased until 1995,

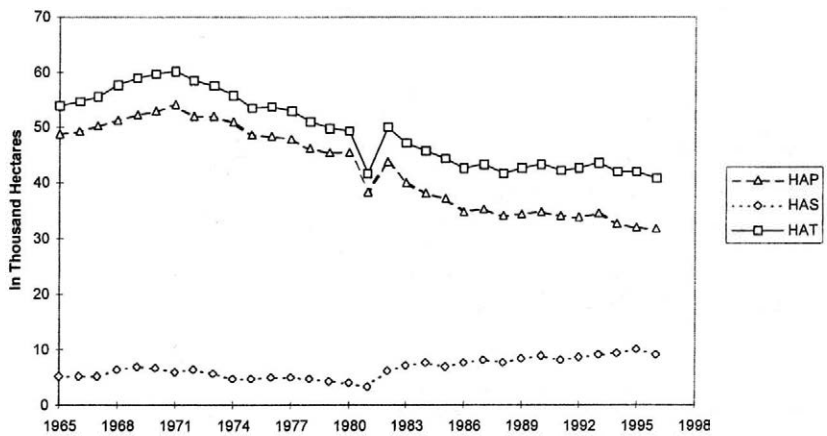

Figure 13. Wheat area harvested

Note: HAP = in private sector, HAS = in "social" sector and HAT = total
Source: Compiled by the author on the basis of SY SLO [various issues]

again declining in 1996 and 1997. Currently, the major part of sugar beet production as well as area harvested is in private sector farms. The expansion in sugar beet areas is correlated with the reduction of area in potatoes, maize, and wheat.

A continuous decline in area harvested for *potatoes* is reported in private sector farms (figure 16). This decline was more substantial in the 1990s. Prior to Slovene independence, surplus domestic potato production was largely sold in the traditional markets in the former Yugoslavia. With trade diversion, these markets were largely lost. As already explained, it seems that the area harvested in the private sector was likely to be overestimated in the past. Harvested area was declining for potatoes, wheat, and maize in the private sector. In the "social" sector, they were increasing for maize and remained rather stable for wheat. Yet, some changes in the structure of production, yields, and harvested areas during the 1990s are also likely to be due to changes in the statistical methodology (OECD 1998).

THE SUPPLY RESPONSE TO CHANGING ECONOMIC CONDITIONS

The supply response model and the coefficients of short-term elasticity of supply are estimated for Slovenian crop products on the basis of the following equation:

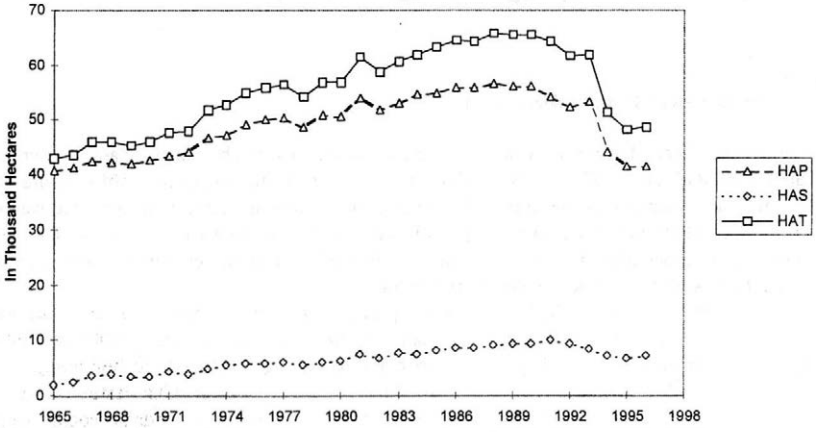

Figure 14. Maize area harvested

Note: HAP = in private sector, HAS = in "social" sector and HAT = total
Source: Compiled by the author on the basis of SY SLO [various issues]

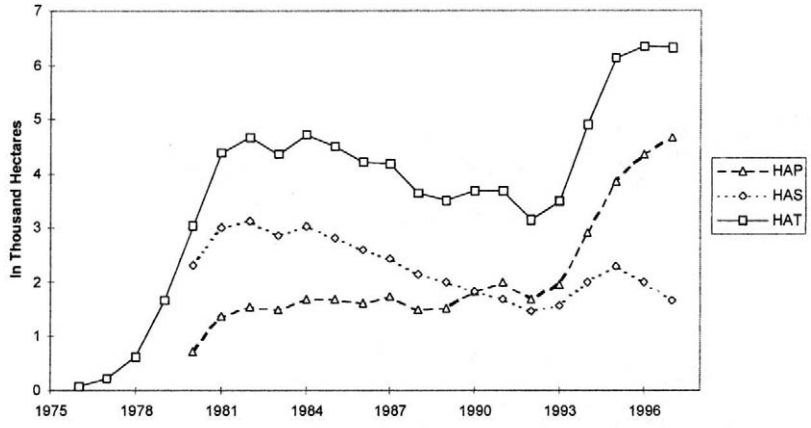

Figure 15. Sugar beet area harvested

Note: HAP = in private sector, HAS = in "social" sector and HAT = total
Source: Compiled by the author on the basis of SY SLO [various issues]

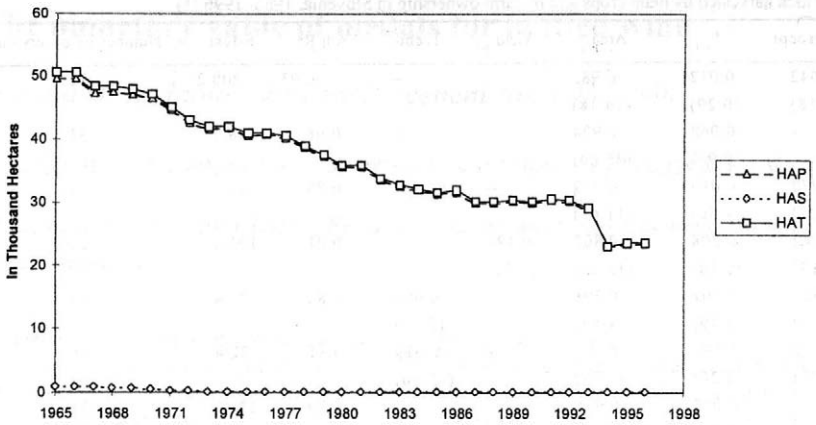

Figure 16. Potato area harvested

Note: HAP = in private sector, HAS = in "social" sector and HAT = total
Source: Compiled by the author on the basis of SY SLO [various issues]

$$\text{Area}_t = b_0 + b_1 P_{t-1} + b_2 \text{Area}_{t-1} + b_3 \text{Yield}_{t-1} + b_4 T + v_t$$

where Area_t is area harvested in the current period and P_{t-1} is the farm-gate price in the previous period which is the output price deflated by the index of crop prices; Yield_{t-1} is yield per ha in the previous period; Area_{t-1} is area harvested in the previous period; T is time (trend); and v_t is an error term.

The regression results for wheat, maize, sugar beets, and potatoes are reported in table 1. The reported regressions are estimated in the logarithm form, so the parameters are at the same time the coefficients of the short-term elasticity, while the coefficient of long-term elasticity can be derived from the estimated regressions. Substantial differences in responses of the area harvested to real price changes by commodity and by farm ownership are found. The estimated short-term elasticity of area harvested with respect to real price in the previous period is found to be positive across commodities, but the coefficients of elasticity are rather small and varied by commodity. They are estimated at less than 10% for wheat, maize, and potatoes; at 20% for sugar beet for private sector farms; and at 11% for sugar beet for "social" sector farms. It seems that sugar beet areas responded more strongly to real prices, especially in private sector farms. Note that the regressions for sugar beet are estimated for the shorter period, e.g., between 1980 and 1996, while for wheat, maize, and potatoes, they are estimated for the period 1965–1996. Nevertheless, the regression results confirmed the pictures presented in the previous section, namely that there was a substantial change in the structure of harvested area as more of the land over time was devoted to sugar beet and less to other alternative crops. This structural change in harvested area could largely be explained by real price development. Also, amount of area in sugar beet was initially rather low as this was a new crop introduced in Slovenian agriculture in comparison with the initial level of area cultivated in other traditional crops.

Except for sugar beet, the estimated intercept term is rather low and not significant. This was the reason that the intercept term was omitted in the case of potatoes in private sector farms and wheat in "social" sector farms. A very mixed picture was also obtained for the elasticity of the area harvested in relation to the yield in the previous year. While, for example, the "social" sector farms reacted to yield increases in maize production by increasing areas, in private sector farms the coefficient of elasticity was close to zero and the parameters were not significant. This could partly be explained by the nature of production. The objective of "social" sector farms was to increase production via increasing yields, while in the past, private sector farms often sold surpluses of production when prices were high enough. If prices were not high enough, private farms increased household consumption, such as using grains for livestock feed. We also report the trend component for sugar beet indicating an increasing pattern of area harvested in private sector farms, and vice versa in "social" sector farms.

All coefficients of elasticity related to area harvested in the previous year are larger than zero and smaller than one and all parameters are significant. These results imply a long-term reaction by farmers and indicate that the price elasticity of supply in the long-term is higher than in the short-term. The farmers are rational in their decisions in the long-term by exhibiting stronger responses to long-term, rather than short-term, temporary changes.

CONCLUSION

The patterns in production, purchased production, the dynamic in yields and in area harvested by main crops (for wheat, maize, sugar beet, and potatoes), by institu-

Table 1. Regressions of area harvested by main crops and by farm ownership in Slovenia, 1965–1996 (*)

	Intercept	P_{t-1}	Area $_{t-1}$	Yield $_{t-1}$	Trend	Adj R^2	F-test	Number of observations
Wheat:	0.042	0.012	0.982	–	–	0.93	200.2	31
private sector	(0.18)	(0.29)	(14.18)					
Wheat:	–	0.062	0.974	–	–	0.68	38.7	31
"social" sector		(0.97)	(26.00)					
Maize:	0.072	0.019	0.979	–	–	0.85	83.2	31
private sector	(0.22)	(1.50)	(11.69)					
Maize:	0.042	0.008	0.802	0.192	–	0.91	101.4	31
"social" sector	(0.15)	(0.18)	(12.86)	(1.30)				
Sugar beet:	0.312	0.201	0.291	–	0.050	0.82	23.4	16
private sector	(3.33)	(3.19)	(1.52)		(3.29)			
Sugar beet:	0.778	0.107	0.391	–	–0.019	0.81	22.4	16
"social" sector	(3.07)	(2.20)	(1.95)		(–2.10)			
Potatoes:	–	0.007	0.994	–	–	0.90	207.1	31
private sector		(0.23)	(105.45)					

(*) 1980–1996 for sugar beets. The regressions are estimated in logarithm form by the ordinary least square method. In the brackets, there are reported t-statistics.

Source: own calculations

tional sector (private and the former "social" sector), and over time (1965–1998) are analysed. The comparison of data suggests that some changes in the structure of production, yields, and harvested areas during the 1990s are also likely to be due to changes in the statistical methodology, while the area harvested in the private sector was likely to be overestimated in the past. This particularly relates for potatoes, wheat, and maize in the private sector.

We found a substantial change in the structure of harvested area as more of the land over time was devoted to sugar beet. Yet, amount of area in sugar beet was initially rather low as this was a new crop introduced in Slovenian agriculture in comparison with the initial level of area cultivated in other traditional crops such as maize, wheat, and potatoes. The structural change in harvested area by individual crops could largely be explained by real price development. Our results of elasticity of individual crop supply with respect to a real price of crop imply a long-term reaction by farmers and indicate that the price elasticity of supply in the long-term is greater than in the short-term. The farmers are rational in their decisions in the long-term by exhibiting stronger responses to long-term, rather than short-term, temporary changes.

Acknowledgements

I am thankful to the participants at the IAMO/AAW Colloquium in Halle (Saale), Germany, for helpful suggestions. The financial support from the Slovene National Science Foundation and the Research Programme of the Commission of the European Communities is gratefully acknowledged. The views expressed are those of the author.

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Arrived on 7th January 2000

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The monetary value of medals for bottled wine

Monetární hodnota výstavních ocenění lahvových vín

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Abstract: Producers of bottled wine have their products evaluated at various wine exhibitions for the purpose of receiving awards that can be displayed on the bottles. This contribution introduces an approach for retailers and producers for estimating optimal prices of wine exhibition awards. A case study has been employed in co-operation with a major Czech wine company to investigate the practical application of the method. Wine exhibition awards are found to be among the important factors affecting consumer preferences for bottled wine. A conjoint experiment allowed for estimating the relative importance of selected wine exhibitions as award origins and for determining the partial utilities of selected awards (medals). Calculating the individual price equivalents for those awards and three selected wines enables the estimation of prices for maximum turnover. According to the approach, price equivalents and mark-ups can be estimated based on consumer preferences for awards. Retailers as well as producers can employ the procedure for matching their offers with specifically designed prices to their target group needs and wants in their individual markets.

Keywords: conjoint measurement, factor analysis, medals, pricing

Abstrakt: Producenti lahvových vín nechávají hodnotit své produkty na výstavách za účelem získání ocenění, které pak prezentují na lahvích daného výrobku. Cílem této práce je přiblížit distributorům a producentům, jak zjišťovat hodnotu ocenění získaných na výstavách vína. Případová studie byla vypracována ve spolupráci s hlavním českým výrobcem vína, aby ověřila praktickou aplikaci metody. Ocenění udělovaná na výstavách vín byla shledána důležitým faktorem ovlivňujícím preference spotřebitelů lahvových vín. Aplikace conjoint analýzy umožnila odhadnout relativní důležitost vybrané výstavy vína a užitek udělených ocenění. Kalkulace ekvivalentních peněžních hodnot pro jednotlivá ocenění pro tři vybraná vína umožňují stanovení cen, které umožní maximalizaci obratu z prodeje vína. Cenové ekvivalenty hodnoty udělovaných ocenění lze odhadnout na základě preferencí zákazníka. Producenti mohou tímto postupem přizpůsobovat nabídku a vytvářet ceny odpovídající potřebám a poptávce u cílových skupin zákazníků na jednotlivých trzích.

Klíčová slova: conjoint analýza, faktorová analýza, ocenění, cena

INTRODUCTION

Competition for bottled wines in the Czech market has already been stiff with the entry of European Union suppliers resulting in a significant downsizing of national production areas (EC 1998). Major importers are Italy, Spain, Hungary, Slovenia and Yugoslavia (Czech Ministry of Agriculture 1999). The recent appearance of an increasing number of wines from "new" production areas world-wide (e.g. California, Chile, South Africa, Australia) still increases the pressure on national suppliers. Consequently, Czech wine producers are searching for ways of matching their offers more closely to consumer preferences to maintain or increase their market share as well as to generate sufficient income from their sales.

PURPOSE OF THE STUDY

The varietal (grape variety) has been found to be amongst the most prominent factors influencing consumer´s choice of wine (e.g. Hauck 1991). The question arises, what other factors are sufficiently important to consumers to be employed by producers (or the retail trade) for creating a favourable product perception leading to higher preference and/ or willingness to pay higher prices. Labels (i.e. wine exhibition awards) are of special interest to retailers/ producers since they are considered to be easily recognisable and to support consumers´ choice by communicating selected product characteristics like superior quality (Sattler 1991). It is assumed that consumers rely to a great extent on easily recognisable labels or tags (i.e. medals) when choosing products instead of reading all the information written in usually small letters on the main bottle label (e.g. Krischik 1998). In general, respective quality signals can be designed in a variety of ways (Burger et al. 1995). Customary options for the label regarding wine exhibition award are gold, silver or bronze medals awarded during a particular wine exhibition.

In the past, wine exhibitions have been established all over the world both at the regional (in the Czech Repub-

lic e.g. Valtické vinné trhy/ Valtice wine market) as well as at the national (e.g. VinoForum) and international level (e.g. Macon Exposition des Grandes Vins/ Foire International des Vins). They are attended by producers, wholesalers, retailers and consumers. During those exhibitions, groups of experts (producers, traders, sommeliers, restaurant managers, etc.) evaluate wines in different categories and select outstanding products to be awarded. The respective awards usually come as medals (gold, silver, bronze), diplomas or other recognitions. Producers and retailers may decide to promote awarded wines using the officially registered award.

In theory, at the point of purchase (in supermarkets or vinothekas), the potential buyers compare competing wine offers by selected attributes, respectively attribute levels, and weight their utility against the price. Hence, the question arises for the supplier, how important a particular wine attribute is to consumers and what are the consumers willing to pay for a particular expression of this attribute (e.g. for a gold medal). Information on wine attribute weights and desired levels can then be used by producers and retailers to design (price) the product (bottled wine) specifically so that it will be perceived by the target groups as superior to the competing products. However, even major wine companies lack the exact knowledge on how consumers evaluate wine awards notwithstanding what monetary value they might place on a particular medal.

Hence, the goal of a applied research project conducted in co-operation with a major Czech wine company was 1) to establish the importance of awards for consumers choice of bottled wines, and 2) to estimate price equivalents of selected awards from wine exhibitions that the producer attends on a regular basis. The market research specifically addresses the following questions:

- Are wine exhibition awards sufficiently important to affect consumer preferences?
- What are the price equivalents for awards of different origin and type?
- What are the prices for maximum turnover?
- What makes consumers believe in wine awards?
- How do consumer characteristics affect answers for the above questions?

METHODOLOGY

Various factors are likely to influence the consumers' choice of bottled wine (see figure 1). These include push factors, pull factors, exogenous factors and economic restraints (time and money). Investigating the role of wine exhibition awards in consumer quality perception, this contribution focus on pull factors. Selected push-factors will also be included in the research for the purpose of explaining the motivational background leading to the stated (un)importance. Some of those factors can be controlled by the supplier (producer/ retailer), others cannot. Of those factors that can be controlled by the supplier, there is a body of evidence to suggest that pull factors (product attributes) play an important role. Not all consumers build their preferences on all criteria. Usually an individual relies on a few criteria for his or her choice.

The current research utilises conjoint analysis to assess the relative importance of awards and price for the consumer decision making associated with the purchase of bottled wines. It was hypothesised that consumers would be more positive towards awarded wines and this would offset any negative perceptions associated with reasonably higher prices. The methodology is based on similar approaches conducted by Schweikl (1985) and Gierl (1995) that have been adjusted for marketing food products.

To provide answers for the commercial client, a survey was conducted in fall/ winter 1999. In co-ordination with the wine producer, a variety of special wine shops (vinotheks) in several cities and towns of the Czech Republic were selected as appropriate locations. This choice

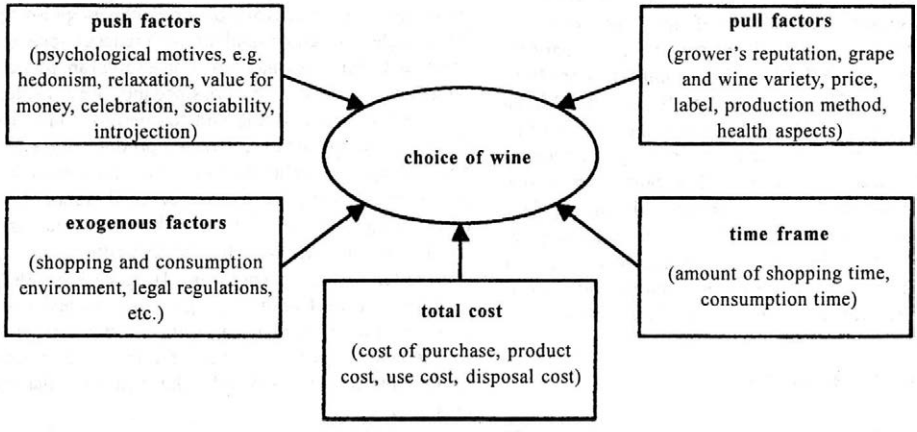

Figure 1: Determinants of Consumers' Wine Choice

Table 1. Design of the conjoint experiment

Factor	Level		
Wine/ price	Ryzlink vlašský (low price level)	Svatovavřinecké (medium price level)	Rulandské bílé (high price level)
Exhibition	Exhibition F (international level)	Exhibition X (national level)	Exhibition V (regional level)
Award	gold award	silver award	no award

reflects the present importance of those shops as the major retail outlets for the client's produce. In the stores, three groups of 0,75l-bottles were displayed. The respective wines (one red and two white varietals) were selected to cover the medium as well as the high price level. They were displayed with their regular labels. Table 1 holds the basic design of the experiment.

At each price level, three prices were used for each wine in the study: original price of the wine, original price +25 CZK, original price –25 CZK (1 US$ equals approximately 40 CZK). Employing a fractional factorial (orthogonal) design reduced the stimuli to be evaluated by the consumers to nine bottles per wine (profiling method). Customers to the stores were randomly selected by interviewers and asked to choose one wine and to rank the bottles according to their preferences. A total of 69 respondents participated in the study, each ranking at least one group of bottles and completing a supplementary questionnaire.

RESULTS

Sample Description

According to the store managers, the collected sample gives an accurate picture of the store customership. Among the visitors of the stores, were citizens of seven nations (mostly Czechs, several Slovaks and a few citizens from Norway, Israel, Germany, Canada and the U.S.). Of all age groups, male customers are nearly double the number of female customers to the special wine shops, which is properly reflected in the sample (1/3 of female respondents, 2/3 of male respondents). Older females are slightly underrepresented in the sample which again goes conform to the regular store clientele. Besides being experienced as consumers (private consumption), a significant number of visitors has a background in private wine production (15%), professional wine buying (12%) or commercial wine production (4%). The surveyed visitors represent annual wine expenditures of nearly 350.000 CZK[1] in average (range: 400–40.000 CZK) and expect to spend between 40 and 1,000 CZK for a bottle of decent wine. Table 2 holds information on the retail outlets, the respondents use to shop for wine as well as on what percentage of their expenditures they spend there.

Considering the client's commercial interest in the study, the familiarity of the respondents with the producer has also been investigated. As it turned out, roughly a quarter of the respondents indicated to be 1) a regular customer, 2) a customer, 3) familiar with the producer's name, and 4) unfamiliar with the producer's name each.

Product attributes affecting consumers' choice

During previous studies, a variety of criteria have been identified to be important to consumers when choosing a particular wine (Hauck 1991). When asked (unaided) to name his/her favourite wine, the consumers submitted the criteria listed in table 3. Obviously, the varietal plays a major role in the consumer decision process when shopping for wine. Only few individuals choose to describe their favourite wine by other criteria (e.g. region). Wine exhibition awards have not been mentioned, neither has the price. The respondents were later asked to rate 14 given criteria on a 5-point Likert-scale in order to assess their importance when buying wine for personal purposes. The results are listed in table 4 and confirm the peak importance of the varietal in the respondents' choice of wine (compare with table 3). While rated equally important as colour or price, wine exhibition awards appear to be important.

Table 2. Store choice and expenditures for wine (n = 69)

	Store/ retail outlet			
	Super-market	vinothek	producer	others
Major source of wine for % of buyers	17	52	24	7
% of buyers' wine expenditures spent there	21	55	18	6

[1]Currency exchange rate: approximately 35 CZK for 1 EUR

Table 3.'Favorite' wines named by the respondents ($n = 69$)

Frequency 'Favorite' by		frequency	favorite varietal
51	varietal	21	Rulandske
8	region	18	Sauvignon
5	producer	15	Ryzlink
2	method	15	Svatovavrinecke
3	color	14	Cabernet Sauv.
		10	Tramin
		9	Frankovka
		6	Muskat
		4	Veltlinske
		4	Chardonnay
		4	Andre
		2	Shiraz
		2	Merlot
		4	others

The considerable number of criteria playing a role in the consumers' product choice (and store selection) represents a major task for producers and retailers when trying to match offers to consumer tastes. In order to support their decisions on product design and on category management, the number of dimensions has been reduced by aggregating bundles of correlated attributes. A factor analysis was employed to perform principal component factor analysis with varimax rotation on 14 product attributes/choice criteria identifying 6 factors. The results are displayed in table 5. Factor loadings range from 0.57 to 0.96, and the total variance explained was 73.4 percent. The six factors were labelled (1) colour, (2) price, (3) look, (5) origin (in a broader sense like 'roßlage', and (6) origin in a narrow sense like 'Einzellage'.

Factors 1 and 2 correspond with only one attribute each: colour and price. Factor 3 can be interpreted as the appearance or look of a bottle of wine. It is based on the attributes awards and packaging. The meaning for awards as attributes in the consumers' decision process is twofold: 1) they contribute to the appearance of products to a large extent (almost 0.8), clearly being a major contributor to this dimension. 2) only one additional attribute contributes to this dimension, thus emphasising the relative importance of the first attribute.

The attributes vintage and store both load strongly on factor 4. No reasonable interpretation can entirely explain this factor which may be a statistical artefact. Factor 5 consists of the attributes country and region of origin as well as the varietal. This may be due to the fact that many varietals are perceived by the consumers as being closely related to a specific region (e.g. 'Pálava', 'Tramínské', 'Veltlínské', etc.) or country (e.g. 'Chablis', 'Tokaj', 'Gewürztraminer', etc.). Moreover, more extensive wine assortments in vinothekas or supermarkets are usually structured by the origin supplemented by varietals that are being considered typical for each area.

Table 4. Importance of selected wine attributes to buyers (aided question) (scale from 1 = not important at all, to 5 = very important)

Attribute	N	Mean[1]	Standard deviation
Varietal (grape variety)	65	4.55 [a]	0.87
Country of origin	68	4.18 [b]	0.90
Region of origin	67	3.98 [bc]	1.07
Vintage (year of harvest)	66	3.98 [bcd]	1.05
Wine type (e.g. cabinet)	68	3.94 [bcde]	1.05
Stopper (e.g. cork)	67	3.87 [cdef]	1.17
Colour (red, white, rosé)	66	3.77 [cdegf]	1.52
Awards (e.g. medals)	67	3.46 [fgh]	1.27
Producer	67	3.43 [ghi]	1.32
Production method (e.g. Barrique)	66	3.35 [ghij]	1.25
Packaging	67	3.26 [ghijk]	1.31
Price	69	3.11 [hijkl]	1.16
Village of origin	66	3.06 [jklm]	1.36
Store	65	2.69 [m]	1.49

[1] Any two (or more) criteria that have one particular letter in their index are not significantly different at the 95% error level. For example: the criterion 'varietal' is significantly more important than all other criteria since no single other criterion has the 'a' – index. The criterion 'region of origin', however, is not significantly more important than the criteria 'vintage', 'wine type', 'stopper', and 'color' since it shares the index c with all of those.

Table 5. Rotated matrix of components (Varimax, Kaiser-Standardisation, $n = 69$)

Attribute	Component 1	2	3	4	5	6
Colour	.961					
Price		.946				
Awards			.795			
Packaging			.775			
Vintage				.758		
Store				.719		
Country of origin					.810	
Region of origin					.704	
Varietal					.652	
Village of origin						.805
Stopper						.707
Producer						.669
Wine type						.613
Production method						.570

Price equivalents for wine exhibition awards

Conjoint analysis (Luce and Tukey 1964) has been employed to assess the value of wine exhibition awards to consumers (Balderjahn 1994, Levin & Johnson 1984, Simon & Kucher 1988). The method allows for simulta-

Table 6. Aggregated results of the conjoint experiment

		Evaluated wine		
		Svatovavřinecké	Ryzlink	Rulandské
Number of valid cases		13	13	15
Relative importance of Award		50.41	57.12	49.39
Relative importance of price		49.59	42.88	50.61
Partial utilities	no award	−1.5165	−.7582	−1.7048
	wine exh. F gold medal	.6630	.3700	.5397
	wine exh. F silver medal	−.6447	−.4377	.30
	wine exh. X gold medal	1.7399	−.7454	1.1730
	wine exh. X silver medal	−1.1062	.7546	.4063
	wine exh. V gold medal	.8168	.3315	.3730
	wine exh. V silver medal	.0476	.4853	−1.0937
Pearson's R		.985	.978	.996
Kendall's τ		.944	.944	.833
Significance		.0000	.0000	.0000

neously estimating 1) the relative importance of selected product attributes in the consumer choice process and 2) the partial utilities of selected attribute levels (Green & Srinivasan 1978, Green & Srinivasan 1990). Table 6 holds the results for the analysis aggregating individual responses.

Since each respondent has been asked to rank at least one wine and due to the exclusion of individual results that did not fulfil quality measures, the number of valid cases for each wine is lower than the original sample size. The quality of the results can be judged by the correlation coefficients Pearson's R and Kendall's τ. While Pearson's R describes the correlation between the metric total utilities and the factual ranks of the bottles, Kendall's τ describes the correlation between the factual ranks and those results that stem from the conjoint analysis. Both quality measures are close to or nearly equal 1 for all evaluated stimuli thus indicating highly significant findings for the aggregated analysis.

The aggregated results of the conjoint experiment confirm the previously stated nearly equal importance of award and price as product attributes for the wines under investigation. Additionally, consumer preferences for particular awards and exhibitions have become clear. In all cases, respondents exhibit the least preference for wines without awards. Except for the wine Ryzlink and the exhibitions X (national) and V (regional), gold medals are valued higher than silver medals. It cannot be stated, however, that a gold medal is always more preferred than a silver medal: in the case of Rulandské, for example, a silver medal from the exhibition X is more valuable than a gold medal from the exhibition V.

At the aggregated level, the total of 41 respondents assigned positive partial utilities to silver and gold medals as compared to no award. At the level of each individual, partial utilities can be translated into price equivalents since the price has been included in the conjoint experiment as another product attribute (Wittkin et al. 1982). The corresponding numbers for one particular respondent in table 7 indicate the amount this individual is willing to pay (at the most) for a bottle of Rulandské that is labelled with the respective award.

In order to identify prices for a maximum turnover, price-sales-functions have been established for specific attribute levels (price-scale p: maximum prices that respondents are willing to pay for a particular award, sales-scale y: number of individuals that are willing to purchase a respectively labelled bottle at a particular or lower price). As an example, two price-sales-functions for Rulandské and the exhibition *X* are shown in figure 2.

Obviously, a linear relationship exists between price and sales. The parameters can be estimated by way of regression analysis: $\hat{y} = a + bp$. The price (increases) for maximum turnover (awards from exhibition *X*) can be estimated at $-59.923/[2(-4.392)] = 6.92$ CZK (silver medal) and $-84.774/[2(-6.262)] = 6.77$ CZK (gold medal). To calculate the retail price, award prices have to be added to the original price. Hence, the optimal retail price for Rulandské with a silver medal from exhibition *X* is 200 + 6.92 = 206.92 CZK. The quality of the results may be judged by the R-Squares that describe the goodness of fit between the empirical data and the regression curve. The

Table 7. Price equivalents for selected awards, respondent # 50 (Rulandské)

Award	Partial utility as compared to no award	Price equivalent for the award (CZK)	Recommended price per bottle (CZK)
X gold medal	2.8778	32.21	232.–
F gold medal	2.2445	25.13	225.–
X silver medal	2.1111	23.63	224.–
V gold medal	2.0778	23.26	223.–
F silver medal	2.0111	22.51	223.–
V silver medal	0.6111	6.85	207.–

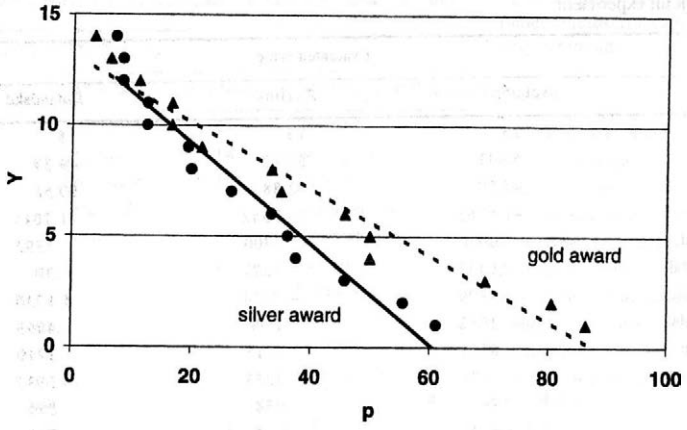

Figure 2. Price-sales-functions for Rulandské

Table 8. Price-sales-functions and prices for maximum turnover (Rulandské bílé)

Exhibition	X		F		V	
Award	silver	gold	silver	gold	silver	gold
R-Squared	.952	.963	.775	.925	.976	.850
Constant	59.923	84.774	63.210	64.475	74.932	58.329
Regression factor	−4.392	−6.262	−5.207	−4.916	−6.771	−4.496
Price for max. turnover	6.92	6.77	6.07	6.56	5.53	6.49
Original price			200			

majority of respective numbers close to 1.00 confirm the assumption of a linear price-sales-function and support the significance of the results. More extensive data for other exhibitions are listed in Table 8.

Except for the international wine exhibition, suggested prices are slightly higher for gold medals than for silver awards. Additionally, the suggested price increases appear to be slightly higher for the international exhibition awards than for awards at the national or at the regional exhibition level. No other aspects in setting prices, like for example odd-pricing (Müller & Bruns 1984) or 99-ending prices (Schindler & Kibarian 1996), have been considered in this calculation.

The conclusion for the commercial wine producer is obvious: price mark-ups based on wine exhibition awards should be carefully planned and executed. In the case of the exhibition X silver medal, setting the retail price one CZK above the price for maximum turnover reduces the number of sales by 1.67 percent. The higher income generated by the mark-up does not compensate for the smaller number of potential buyers that are willing to spend that money for an awarded wine. On the other hand, setting the retail price one CZK below the price for maximum turnover robs the producer of possible income since the consumers are willing to spend more money on that awarded wine.

Finally, the question arises as to what the causes are for the stated appreciation of wine exhibition awards by consumers. According to previous research on motivational factors influencing wine purchase, it has been assumed that quality assurance as well as prestige and shopping time play an important role (e.g. Hauck 1990).

Table 9. Motivational aspects driving the choice of awarded wines (5-point Likert-scale anchored at—2 = absolutely disagree and +2 = absolutely agree with 0 = neither agree nor disagree as a midpoint)

Statement	Number of cases	Mean	Standard deviation
Awarded wines have their quality certified by independent experts.	67	.836	.93
I feel more confidence to choose a decent wine when selecting an awarded wine.	67	.642	.88
When buying awarded wine I can be sure to receive value for my money	67	.552	.98
Wine awards help me to save time when choosing wine.	66	.455	.81
Serving awarded wine to guests makes me feel more prestigious.	66	.424	1.08
I feel that awarded wines generally taste better.	67	.239	.86

Some corresponding statements have been included in the questionnaire for evaluation by the respondents. The results listed in table 9 confirm the suitability of wine exhibition awards for quality assurance since they are recognised by the consumers for building confidence and for signalling value for money. Additionally, the respondents firmly believe in the independence of awarding committees. Saving time and prestige are also among the motives for relying on awards as well as the perception that awarded wines taste better.

CONCLUSIONS

The results of the empirical study are not founded on an extensive sample. Nevertheless, the contribution demonstrates more than the practicability of the theoretical approach. Based on the quality measures, some significant conclusions can be drawn to support the pricing decisions. Clearly, wine exhibition awards are among the important product attributes affecting consumer preferences. Attending wine exhibitions for the purpose of receiving awards that are recognised and appreciated by the clientele appears to be a basically promising strategy for producers.

Currently, the wine company displays national and regional awards on its wine bottles. The study also investigated consumers' recognition of different award levels to support future decisions on bottle labelling. The results of the survey seem to suggest that the origin of the award (place of the exhibition) affects consumer preferences to a certain degree (e.g. significant differences in partial utilities could be identified for the wine Svatovavřinecké). However, a thorough testing of this hypothesis for all wines could not be undertaken due to the insufficient number of valid cases. This remains to be studied in future research where also the impact of consumer expertise and education on the preferences for particular award origins could be investigated. If the results were to indicate that target groups recognise differences in the demand level underlying the grading procedure at different exhibitions, the producer should make every effort to satisfy consumer expectations by winning the appropriate medals. In case the consumers do not distinguish between different exhibitions, the producer has two options: 1) focusing his efforts on easily available medals, or 2) educating the consumers (for example in co-operation with the organisers of the exhibition) by communicating the more stringent grading standards of a particular exhibition.

In several cases, consumers value gold awards slightly higher than silver medals. However, there are not enough valid cases to state significant differences between the two levels. Currently, it can only be recommended to display all awards that can be won.

Calculating the individual price equivalents for a number of awards and wines enables the estimation of prices for maximum turnover. The corresponding mark-ups range from 3.6 to 6.8 CZK being lower than the mark-ups currently employed be the producer resulting from a rule-of-thumb-method. While awards for the more expensive wine Rulandské seem to come with higher mark-ups than awards for the less expensive wines Svatovavřinecké and Ryzlink, the sample was not adequate to answer this particular question sufficiently.

This contribution introduced a general approach for estimating the value of wine exhibition awards using a case study. Most of the questions examined above can be answered only in a highly specific fashion for an individual producer or retailer. At each site, consumers share different preferences. Depending on the retailer's goals and objectives, some consumer groups might be more interesting as customers than others. Employing the procedure introduced before, price equivalents and mark-ups can be estimated based on consumer preferences for awards. Retailers can employ the procedure for matching their wines with specifically designed prices to their target group needs and wants in their individual markets.

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Arrived on 1st August 2000

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Využití zemědělské půdy v souvislosti se vstupem ČR do EU

Ve dnech 16.–20. října 2000 se konal ve Špindlerově Mlýně seminář s mezinárodní účastí na téma „Využití zemědělské půdy v souvislosti se vstupem ČR do EU". Pořadatelem tohoto semináře byl Výzkumný ústav zemědělské ekonomiky Praha pod záštitou Ing. Antonína Kaliny, 1. náměstka ministra zemědělství ČR.

Cílem semináře bylo seznámit širokou odbornou veřejnost s nejaktuálnějšími otázkami z oblasti rozvoje trhu s půdou a ocenění půdního fondu, vlivu zemědělské a regionální politiky na využití půdního fondu, kategorizace a hodnocení zemědělského půdního fondu, současných a připravovaných právních norem na ochranu a využití půdy.

Mezinárodního semináře se zúčastnilo více než sto specialistů z České republiky, Slovenska, Německa, Rakouska, Francie, Polska, Maďarska a Bulharska. Na semináři bylo předneseno 29 příspěvků začleněných do čtyř problémových okruhů.

Ing. Stanislav Jelen, ředitel Ústředního pozemkového úřadu MZe ČR, v úvodním projevu vyzdvihl význam pořádaného semináře pro vzájemnou výměnu zkušeností. Podrobně pohovořil o aktuálních otázkách využití zemědělské půdy ve vztahu ke konkurenční schopnosti, státních zájmů a o úloze MZe při řešení problémů v oblasti využití půdy v předvstupním období. Zvláštní pozornost věnoval otázce pozemkových úprav v České republice.

První problémový okruh se týkal vlivu zemědělské a regionální politiky na využití půdního fondu.

Ing. Tomáš Doucha, CSc., ředitel Výzkumného ústavu zemědělské ekonomiky (VÚZE), Praha, v příspěvku ***Česká zemědělská politika v předvstupním období a využívání zemědělské půdy*** rekapituloval analytické pozadí předvstupní agrární politiky ČR, představil možné vize zemědělství ČR a analyzoval způsoby využití zemědělského půdního fondu. Pozornost věnoval Evropskému modelu zemědělství jako základu strategie zemědělství ČR a opatřením agrární politiky k realizaci tohoto modelu v konkrétních podmínkách ČR. Upozorňuje na rizika i příležitosti spojené s realizaci Evropského modelu zemědělství, včetně prvních zkušeností zemí EU.

Doc. Ing. Magdalena Hrabánková, CSc. (Ministerstvo zemědělství ČR) v příspěvku ***Vliv regionální zemědělské politiky na využití půdního fondu ČR*** zdůraznila nutnost koncentrace na regionálně diferencovanou strukturální politiku, která vezme v úvahu nejen opatření Evropské unie, ale také akceptovatelné výsledky transformace české ekonomiky. K tomu je třeba užívat systematické hodnocení všech aspektů podmínek území, tj. ekonomických, sociálních, ekologických ve vztahu k optimálnímu využívání zemědělského potenciálu oblastí. Zabývá se připravovaným Sektorovým operačním programem „Rozvoj venkova a multifunkční zemědělství" a jeho významem pro upřesňování agrární politiky ČR v souladu s politikou rozvoje venkova.

Dr. Denis Barthelemy a Dr. Jean-Pierre Boinon (Unité Mixte de Recherches INRA-ENESAD, Dijon) ve svém příspěvku ***Politika ve vztahu k půdě, řízení a struktura farem ve Francii*** vysvětlují administrativní systém kontroly užívání půdy SAFER, který napomáhá státu ovlivňovat a řídit velikost farem s cílem dosáhnout optima. Uplatňování vlastnických práv k půdě v jejich absolutní podobě se ukázalo být překážkou v rozvoji zemědělství. Předpisy platné ve Francii v oblasti užívání půdy, nájmu, pronájmu a trhu z půdou podporují modernizaci farem zejména rodinného typu.

Dr. Klaus Wagner (Bundesanstalt für Agrarwirtschaft, Wien) v příspěvku ***Plán rozvoje venkova*** seznámil zúčastněné s projektem Interreg II nazvaným „Přírodní zdroje", na kterém se Rakousko podílí spolu s Maďarskem, Německem a Řeckem. Zdůraznil potřebu zohlednit v rozvojovém plánu nejen produkční funkce, ale také ochranou a ekologickou funkci území spolu s vytváření příjemného prostředí pro život obyvatel regionu.

Ing. Petr Tuček, CSc. (VÚZE) v příspěvku ***Vztah aktivního zahraničního obchodu s agrárními produkty k využití zemědělské půdy*** pojednal o perspektivách růstu objemu mezinárodního obchodu zemědělskými produkty v podmínkách narůstajícího počtu obyvatelstva a zejména ve vztahu k problému přelidnění v zemích třetího světa a limitovaného rozsahu půdního fondu v některých rozvinutých zemích.

Ing. Alois Čaněk (Územní odbor Ministerstva zemědělství ČR, Znojmo) se v příspěvku ***Vliv zemědělské a regionální politiky na využití půdního fondu v okrese Znojmo*** zaměřil na konkrétní dopady transformace a privatizace zemědělství na stupeň využívání půdy v tomto produkčně významném okrese. Analyzoval dopady dosavadní agrární politiky ČR na využití půdního fondu a představil možnosti, které pro budoucí rozvoj udržitelného zemědělství a venkova poskytuje předvstupní pomoc EU.

Druhý problémový okruh byl věnován otázkám trhu s půdou, ocenění půdního fondu a pozemkovým úpravám.

Ing. Jiří Němec, CSc. a Ing. Marie Štolbová, CSc. (VÚZE) v příspěvku ***Trh s půdou ve vztahu k pozemkovým úpravám*** konstatovali, že rozvoj trhu s půdou i objem pozemkových úprav v ČR je závislý na prosperitě českého zemědělství. Seznámili účastníky s nejnovějšími výsledky šetření o tržních cenách zemědělské půdy. Hodnotili také vliv současné a připravované legislativy na trhu z půdou a vývoj pozemkových úprav.

Prof. dr. hab. Lech Ostrowski (Institut zemědělské a potravinářské ekonomiky, Varšava) v příspěvku ***Vybrané problémy polské politiky ve vztahu k půdě v procesu vstupu do Evropské unie*** podrobně informoval o zákonných úpravách užívání půdy v Polsku, o vývoji trhu s půdou v roce 1999, vývoji informačního systému o půdě a procesu přizpůsobování polských zákonů, týkajících se půdy evropským normám.

Ing. Jaroslav Jánský, CSc. a Ing. Jiří Jandák, CSc. (Mendelova zemědělská a lesnická univerzita, Brno) v příspěvku ***Některé poznatky trhu se zemědělkou půdou v okrese Znojmo*** upozornili na vysokou nabídku půdy ve vztahu k poptávce, což se projevuje na velmi nízké tržní ceně ve srovnání s úřední cenou půdy.

Dr. Endre Tanka (Výzkumný ústav zemědělské ekonomiky a informací, Budapešť) v příspěvku ***Požadavky EU na zemědělský trh a trh s půdou při vstupu na příkladě Maďarska*** se zaměřil na požadavek EU zajistit volný pohyb kapitálu v rámci EU, který má legální základ v Evropských dohodách. Pro kandidátské země to znamená plnou liberalizaci trhu s půdou, tj. prodej pozemků právnickým osobám i cizincům. Autor předpokládá, že v Maďarsku povede tato liberalizace ke snížení dominance velkých farem a že přijetím norem EU by se stát vzdal možnosti formovat strukturu farem. Upozorňuje, že kandidátské země budou čelit velkému problému, jak ovlivňovat vznik životaschopných hospodářství, jak přispívat k racionálnímu využívání a ochraně půdního fondu a k uplatňování národní politiky ve vztahu k půdě.

Prof. Dr. Ivanka Janakieva (Ústav zemědělské ekonomiky, Sofie) a *Prof. Dr. Paunka Božinova* (Ústav vědy o půdě a agroekologii, Sofie) v příspěvku ***Půdní reforma a trh půdou v bulharském zemědělství v přechodovém období*** analyzovaly hlavní slabiny, chyby a důsledky, které přinesla realizace pozemkové reformy v období přechodu Bulharska k tržnímu hospodářství. Předložily návrhy na konsolidaci a racionalizaci vlastnických vztahů k půdě v souvislosti s aktivizací trhu s půdou a k zavedení odpovídajících zákonů ke stimulaci trhu s půdou.

Ing. Jaroslav Vigner, CSc. a Ing. Václav Voltr, CSc. (Pozemkový fond ČR) v příspěvku ***Privatizace zemědělské půdy a předpoklady vývoje tohoto procesu v ČR*** seznámili účastníky s aktuálními úkoly Pozemkového fondu v procesu privatizace zemědělské půdy. Zdůraznili, že se jedná o dlouhodobý proces, neboť zhruba jedna polovina státem vlastněné půdy je v současné době z různých důvodů blokována. Analyzují faktory, které ovlivňují privatizaci zemědělské půdy a zvažují další možný vývoj v oblasti privatizace.

Ing. Václav Mazín (Okresní úřad Plzeň-jih) v příspěvku ***Nové perspektivy a trendy pozemkových úprav v rámci regionální politiky*** zhodnotil proces pozemkových úprav v uplynulých deseti letech a vyzdvihl důležitou roli, kterou budou pozemkové úpravy hrát v budoucím rozvoji regionální politiky jako nástroj tvorby krajiny, ochrany přírodních zdrojů, při tvorbě moderních informačních systémů a pro růst cen půdy ve vlastnictví fyzických osob i obcí.

Třetí blok příspěvků se věnoval kategorizaci půdního fondu a informačním systémům o půdě v souvislosti s poskytováním podpor do zemědělství.

Ing. Marie Štolbová, CSc. a Ing. Jiří Němec, CSc. (VÚZE) v příspěvku ***Příprava nařízení vlády ČR k podporám v zemědělství v souladu s předpisy EU*** podrobně informovali o připravovaných úpravách v systému poskytování podpor směřujících do mimoprodukčních funkcí zemědělství, na údržbu krajiny a programy k podpoře méně příznivých oblastí v ČR. Věnovali se metodice stanovení méně příznivých oblastí pro rok 2001 v návaznosti na legislativu EU. Upozornili na dosaženou míru shody a představili úkoly, které bude nezbytné vyřešit v předvstupním období.

Ing. Zdeněk Tomiška (Výzkumný ústav meliorací a ochrany půd, VÚMOP) v příspěvku ***Kategorizace zemědělského půdního fondu ve vztahu k poskytování podpor v zemědělství*** upozornil na nezbytnost adekvátní klasifikace a hodnocení přírodních podmínek v návaznosti na produkční, ekonomické, ekologické a sociální vztahy. Zabýval se také klasifikací produktivnosti důlních území, území znečištěných škodlivinami, ploch poškozovaných pravidelnými záplavami a produktivnosti území z hlediska vnějších dopravních vztahů.

Ing. Kateřina Brandová (Ministerstvo zemědělství ČR) v příspěvku ***Využití zemědělského půdního fondu z hlediska nového Nařízení Rady Evropských Společenství č. 1257 z roku 1999*** podrobně rozebrala opatření NR 1257/99 (ES) z hlediska využití půdního fondu, zejména využití méně příznivých oblastí a oblastí s ekologickými omezeními, z hlediska zalesňování zemědělské půdy, uplatnění agro-enviromentálních opatření, zlepšování kvality půdy a úpravy pozemků.

Ing. Štefan Buday, PhD. (Výskumný ústav ekonomiky poľnohospodárstva a potravinárstva, Bratislava) v příspěvku ***Daňové zatiaženie poľnohospodárskych pozemkov na Slovensku a krajinách EÚ*** zhodnotil současnou daňovou soustavu na Slovensku z hlediska daňového zatížení pozemků a porovnal ji se systémy pozemkové daně platnými ve vybraných zemích EU. Navrhuje přehodnocení a úpravy sazeb daně z pozemků snížením sazby u orné půdy a zrušení daně u TTP na pozemcích s nízkou úřední cenou půdy.

Prof. Dr. Gyula Varga (Výzkumný ústav zemědělské ekonomiky a informací, Budapešť) v příspěvku ***Stav***

vlastnictví zemědělské půdy, založený na výzkumu v oblasti obcí Harta a Szakmár informoval o výsledcích transformace zemědělství Maďarska, kdy rozbití velkých celků a vznik velkého počtu malých farem obhospodařovaných převážně vlastníky vyšších věkových kategorií, hospodařících často bez efektivního využití moderních technologií na malých parcelách, se ukázalo být překážkou dalšího rozvoje maďarského zemědělství. Navrhuje přijmout opatření, jež by vedla ke vzniku nezemědělských pracovních příležitostí na venkově, k předčasnému odchodu do důchodu, ke zvýhodnění nákupců půdy a ke stimulaci dlouhodobých pronájmů.

Prof. Ing. Miloslav Janeček, DrSc. (ředitel Výzkumného ústavu meliorací a ochrany půdy) v příspěvku ***Kategorizace podpor protierozních opatření podle potenciální ohroženosti zemědělského půdního fondu erozí*** navrhl zohlednit specifické podmínky různých regionů ve vztahu k ohroženosti půdy vodní i větrnou erozí. Na tomto základě sestavit kategorizaci protierozních a protipovodňových opatření a soubory těchto opatření promítnout do jednotlivých regionů ČR. Navrhuje zařadit „Programy protierozní ochrany" mezi podpůrné programy v rámci Nařízení vlády.

RNDr. Blanka Ilavská a Mgr. Richard Lazúr (Výskumný ústav podoznalectva a ochrany pody, Bratislava) v příspěvku ***Využitie informačného systému o pôde VÚPOP v podpornej a dotačnej politike rezortu pôdohospodárstva SR*** podrobně informovali o současném stavu budování grafického informačního systému o půdě (GIS) na VÚPOP, automatizovaném informačním systému o půdě, bonitačním informačním systému, informačním systému monitoringu půd a o současné praxi využívání GIS při hodnocení zemědělských půd Slovenska.

Čtvrtý blok se zabýval změnami ve struktuře půdního fondu a právními aspekty ochrany a využití půdy.

Ing. Helena Součková, CSc. (VÚZE) v příspěvku ***Nepotravinářské využití zemědělské půdy*** upozornila na nejvýznamnější směry nepotravinářského využívání zemědělské produkce, vývoj rozsahu nepotravinářského využití půdy v členění podle jednotlivých nepotravinářských plodin v EU a na nejdůležitější dokumenty a konkrétní cíle v rámci programů nepotravinářského užití zemědělské produkce v ČR.

Dr. Erzsébet Tóth (Výzkumný ústav zemědělské ekonomiky a informací, Budapešť) v příspěvku ***Charakteristiky struktury vlastnictví a užívání půdy deset let po sociálně-ekonomických změnách v Maďarsku*** zdůraznila, že proces transformace a privatizace maďarského zemědělství, který vyústil ve vznik velkého množství malých farem při přežívání některých velkých celků, přinesl mnohé rozpory. Nepříznivé ekonomické důsledky má bezprecedentní fragmentace půdy a oddělení vlastnictví půdy od jejího užívání. Je základním zájmem Maďarska zmírnit současné napětí, které brání konkurenceschopnosti sektoru v období, kdy se připravuje na vstup do EU.

Doc. RNDr. Ivan Bičík, CSc., RNDr. Leoš Jeleček, CSc., Mgr. Lucie Kupková, RNDr. Radim Perlín (Univerzita Karlova , Přírodovědecká fakulta, katedra sociální geografie a regionálního rozvoje) v příspěvku ***Dlouhodobé trendy změn využití půdy v Česku a jejich hybné síly 1845–2000*** poskytli celkový přehled o hlavních změnách v užití půdy v Čechách za posledních 150 let se zaměřením na sociální síly, jež k daným změnám vedly. Analyzovali podrobněji poválečné období, kde politická rozhodnutí byla rozhodující a změny nejmarkantnější. Z analýzy posledních let vyvozují, že tržní hospodářství má za následek environmentálně příznivé změny v užití půdy.

RNDr. Leoš Jeleček, CSc. (Univerzita Karlova, Přírodovědecká fakulta, katedra sociální geografie a regionálního rozvoje) v příspěvku ***Vliv změn ve struktuře půdního fondu 1948–1990 v oblastech Česka postižených povodněmi roku 1997 na rozsah povodní*** analyzoval změny zastoupení orné půdy, TTP, zalesněné půdy a ostatních ploch a doložil, že dnešní struktura půdního fondu ČR, dramaticky změněná zejména vývojem po 2. světové válce, spíše snižovala důsledky katastrofálních záplavových dešťů v červenci roku 1997.

Prof. Ing. A. Prax, CSc., Ing. J. Rožnovský a Ing. L. Kubík (Mendelova zemědělská a lesnická univerzita v Brně) v příspěvku ***Synergie klimatu a půdních faktorů působících na vznik marginálních podmínek pro zemědělskou výrobu*** se zaměřili na analýzu výskytu bezesrážkových období v produkčních regionech jižní Moravy v normálovém období let 1961–1990, na charakteristiku diferencovaného projevu srážkového deficitu ve vztahu k zrnitostně lehkým půdám a vlivu těchto faktorů na ztráty v zemědělské produkci.

Ing. Alena Mládková (Správa Krkonošského národního parku, Vrchlabí) v příspěvku ***Péče o trvalé travní porosty v KRNAP a jeho ochranném pásmu*** zhodnotila dosavadní péči o údržbu luk a pastvin v Krkonošském národním parku a finanční podporu, která je pro tento účel vynakládána. Konstatovala, že příspěvky poskytované MZe a MŽP jsou účelně využity ku prospěchu krajiny a jejich přírodních složek a zároveň pomáhají těm, kteří jsou nenahraditelnými pečovateli o krajinu.

Doc. Ing. Jaroslava Vráblíková, CSc. a *Ing. Petr Vráblík* (Fakulta životního prostředí UJEP, Ústí n. L.) v příspěvku ***Problematika využití půd v severočeském regionu*** upozornili na specifika, která vykazuje zemědělská činnost a užívání půdy v severočeském regionu, vysoce devastovaném činností člověka. Naznačené problémy signalizují nutnost restrukturalizace hospodaření, posílení orientace na péči o krajinu a skýtají možnosti pro netradiční nepotravinářské využívání půdy pro technické a energetické účely.

Ing. Zdeněk Trávníček, CSc. (VÚZE) v příspěvku ***Problematika zemědělského podnikání v méně příznivých oblastech (LFA) v ČR*** poukázal na základě rozsáhlého faktografického materiálu na některé nelogické vazby

mezi strukturou hospodaření v okresech ČR a mírou v jaké je jejich území zařazeno do méně příznivých oblastí. Upozornil, že zejména vysoké zornění některých okresů je v rozporu s definicemi méně příznivých oblastí podle NR 1257/99 (ES).

Na semináři zazněno mnoho podnětných myšlenek a názorů, využitelných při dalším formování agrární politiky resortu a souvislosti s připravovaným vstupem do EU

Ing. Marie Štolbová, CSc., VÚZE Praha, Česká republika