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Using off the PEM method for evaluating agricultural policies

Využití metody PEM pro hodnocení zemědělských politik

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Abstract: For the possibilities of agricultural policy efficiency evaluation, there is necessary identification of benefits and costs of particular instruments of agricultural policy. The efficiency of policy objectives fulfillment cannot be evaluates only on the basis of direct impact analysis of these policy instruments, but multidimensional impact of particular agricultural support measures must be taken. A methodological framework for this multidimensional impact of agricultural policy instruments assessment is provided by the PEM – Policy Evaluation Matrix. The paper is focused on policy evaluation matrix description, problems of its application for particular agricultural policy instruments efficiency assessment and on description of analytical framework for the model of agricultural policies impacts evaluation.

Key words: agricultural policy, Policy Evaluation Matrix, evaluation of agricultural policy measures, PEM crop model, PEM dairy model, market equilibrium

Abstrakt: Pro možnosti hodnocení efektivnosti zemědělské politiky je nezbytné identifikovat přínosy a náklady různých nástrojů této politiky. Efektivnost naplnění cílů zemědělské politiky nelze hodnotit pouze na bázi přímé analýzy těchto nástrojů, ale prostřednictvím multidimensionálních dopadů jednotlivých opatření. Metodologický rámec takového hodnocení umožňuje metoda PEM (Policy Evaluation Matrix). Příspěvek se zabývá popisem PEM a vyhodnocením její efektivnosti ve vztahu k jednotlivým nástrojům zemědělské politiky. V článku je dále popsáno využití této metody k modelování dopadů agrární politiky vybraných členských zemí OECD na světový agrární trh pomocí modelu rostlinné výroby EU. Autoři propisují uplatnění této metody v podmínkách České republiky v rámci grantového projektu NAZV.

Klíčová slova: zemědělská politika, matice hodnocení politiky (PEM), hodnocení opatření zemědělské politiky, model PEM pro rostlinou výrobu, model PEM pro mléko, tržní rovnováha

INTRODUCTION

When emphasizing objectives of agricultural policies, particular states have variety of forms of agricultural support to their disposal. These political instruments may be essentially divided into three basic groups: various forms of market price support, agricultural inputs subsidies and direct income support which altogether create a system of support of agricultural sector. However, the system of political instruments can vary in time with changes of domestic policy priorities or with the development and conclusions of various trade agreements. The system of political instruments can be also changed because of different impact of particular measures on political objectives. Then for example two political measures may have identical impact on income of agricultural producers, while their impact on trade with agricultural commodities, employment, rural development or environment may be substantially different.

At the same time, it may be made out that regardless the planned and required direction of the impact, any change of a policy usually influences not only primary

target of the policy measure but has a multidimensional impact. For example, a change in market price support may have side effect on environment or a change of policy in the area of environmental protection may have an impact on trade.

The result is that for identification of benefits or costs of particular measures of agricultural policy, not only direct impact of these measures must be contemplated but also the multidimensional character of particular forms of support has to be taken in.

Within OECD countries, there is used for evaluation of the extent of agricultural support the Producer Support Estimate (PSE). It indicates the value of monetary transfers to agriculture resulting from agricultural subsidies. However, the question is to what degree is the PSE able to reveal changes in the structure of the system of agricultural supports, especially the shift from market price support towards various forms of direct payments which is accompanied by the changed effects on consumer and taxpayer costs of support, farm incomes, profits of input suppliers, production, consumption and trade volumes.

This contribution has been developed in the frame the grant research project NAZV QC 1401 „Využití metody PEM pro vyhodnocování variant agrární politiky ČR“.

Solution of the problem requires developing an analytical framework within which, using the information on support levels provided by the PSE, such questions could be examined. Such a methodological framework enabling to follow the multidimensional impact of agricultural policy measures is offered by a matrix approach to evaluation of agricultural support measures.

The objective of this article is both to characterize policy evaluation matrix for agriculture (PEM), to describe methodological principles of the PEM modeling and finally to show a form of the real PEM model (EU PEM crop model), which is developed in the OECD Center in Paris and which is actually used by the Czech grant team for creating the Czech PEM model for needs of Czech agrarian policy makers.

MATRIX APPROACH TO THE EVALUATION OF THE IMPACT OF AGRICULTURAL POLICY MEASURES

The Policy Evaluation Matrix (PEM) is a table of policy effects. The PEM presented in this paper uses

- a) row labels to denote different agricultural support measures. The number of rows in the PEM depends on the number of measures under scrutiny and on the detail of classification of these measures (in detailed analysis, the number of these measures may be relatively numerous);
- b) column headings to denote indicators of the effects of the various support measures on variables of general interest to policy makers. The number of columns identifying particular aspects of policy effects can differ. It depends on the level of differentiation when defying categories influenced by agricultural policy.

The numbers in the each cell of the PEM are estimates of the economic costs or benefits or commodity and input volume effects of changes in support measures. Policy impacts of main interest are those attributable to major changes in agricultural policy.

	Monetary transfer	Income transfer	Employment impact	Trade impact
Market price support				
Direct income support				
Input subsidy				

Figure 1. Policy Evaluation Matrix

In Figure 1, there is presented one example - a simplification of the basic PEM. It contains three rows, corresponding to three main categories of support (market price support, direct income support and subsidies to purchased inputs) and four columns, corresponding to four main spheres of policy effects (monetary transfer, farm income transfer, farm employment impact and trade impact). The question is the choice of appropriate indicators for measuring impacts of agricultural policy within a particular category.

For interpreting the results shown in this matrix, it is usually necessary to distinguish between political impact of direct interest and particular indicator used to measure that impact. Moreover, there may be more than one indicator measuring the impact within particular category. It will depend on the level of detail. For example, the category "monetary transfer" can be divided into categories of taxpayer and consumer transfers monitored by the OECD.

Similarly, regardless what impact of particular measures within country, region or for commodity is considered, numbers in cells of the matrix could be the sum of monetary transfers, provided under different conditions and summarized into one category. For example in the category market price support, such a number could include a support provided under zero restrictions, under restrictions on output used or under restrictions on the scope of used inputs. Similarly there is a number of forms of direct income support and input subsidies. These possibilities would mean increased number of rows.

THEORETICAL BACKGROUND OF THE PEM MODELS

One of decisive prerequisites for successful estimate of elements of the PEM is to define corresponding framework of the model. The modeling framework comes from aggregate, partial equilibrium model of the farm sector elaborated by Gardner (1987), which provides basic analytical structure both for the PEM crop and PEM dairy models. First developed by Hicks to study issues in labor economics, it has been widely applied in general economic analysis. The development of the model for analysis of agricultural price support is generally credited to Floyd (1985). Its application here follows most closely the applications found in Atwood and Helmers (1998), Gunter et al. (1996) and in Hertel (1989).

The objective of the analysis using this model is quantification of medium and long run impacts of agricultural policy changes. In this framework, reaction of agricultural commodity supply, corresponding with a given time horizon, is determined by an aggregate production function, associated with a demand function for agricultural inputs and a supply function of these inputs.

For the analysis, two groups of inputs are considered: *farm owned inputs (factors)* and *purchased inputs (factors)*. This division enables separate evaluation of the impact of particular agricultural policy measures on agricultural enterprises and individual farmers who are sup-

posed to use "own" inputs, and suppliers of inputs who are supposed to supply agriculture by "purchased" inputs. This division includes the following inputs:

- a) category "farm owned" factors includes especially farm labor, fixed capital and farm land
- b) category "purchased" factors contains mainly machinery, fertilizers, agricultural chemicals, feed concentrates, interest expenses and energy.

For each of inputs, there was constructed a *model of partial equilibrium*, where supply of inputs and demand for these inputs determine market price of this input. This is indicated in the upper part of Figure 2, which illustrates basic structure of the PEM model. In this model, both production elasticity and price elasticity of supply of inputs are based more on theoretical assumptions than on empirical results. These assumptions come out from the fact that any of inputs is not perfectly more fix, however "farm owned" inputs are considered fixer than purchased inputs. The consequence of this fact is that lower price elasticities are considered for own inputs than for those purchased. Similarly, any of inputs is not considered perfectly mobile, however purchased inputs are considered more mobile than farm owned inputs. As a result, supply of purchased inputs has higher price elasticities.

In the lower part of Figure 2, there are presented supply and demand relations in commodity markets. Demand for domestic consumption is presented through the system of equations when both substitution and complementary price relations among particular commodities are taken into account. The used arrows illustrate price and quantitative relations.

Accordingly, export demand and import supply are presented through a system of trade equations reflecting price reactions in world markets. Demand and trade elasticities used in these equations are taken from the AGLINK model (a model of the world agricultural market equilibrium).

Commodity supply determined by production function reflects identity between the extent of used inputs and output. Demand for inputs is based on the usual assumption of restricted profit maximization which is limited by production relations and inputs supply. This fact connects input markets with commodity markets to the extent that a change in support measures aimed at one of these markets will have simultaneously impact on all prices and quantities determined by the market.

Figure 2 shows three basic groups of instruments of agricultural policy: *market price support (MPS)*, *direct*

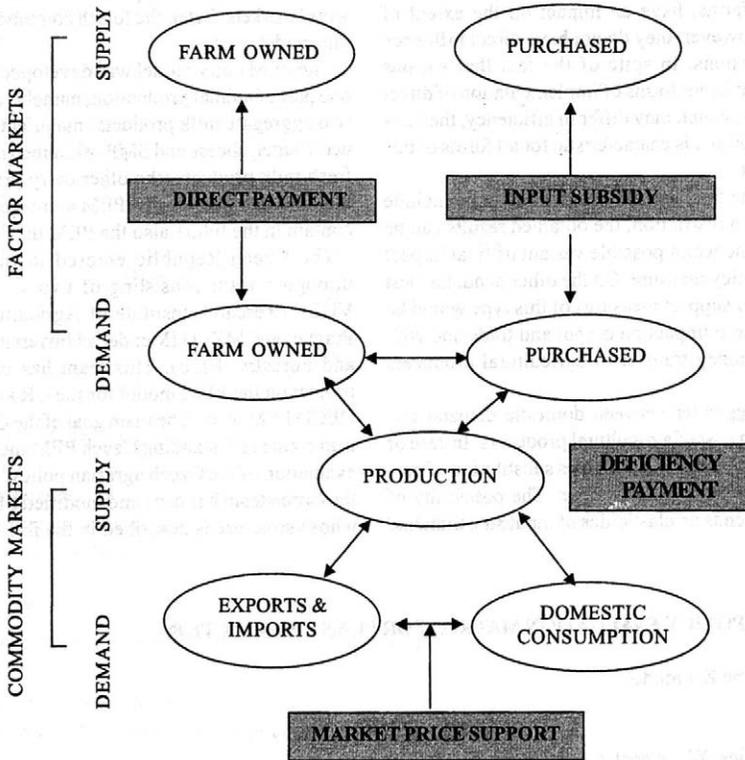


Figure 2. Main elements of the PEM model

income support or direct payments (DP) and input support or input subsidies (IS). To be able to model the influence of instruments of agricultural policy, we must first determine primary impact of these measures. It means to decide which price is influenced as the first. DP and IS have primary impact in factor markets while MPS is primarily reflected in commodity markets.

Concept of direct payments is in this model narrower than the one actually defined by the OECD for calculation of the Producer Support Estimate. For the PSE calculation there are into DP included not only direct transfers to agricultural producers, based for example on used farm land, but also deficiency payments which are linked to output (that is why in Figure 2, there may be shown another form of instruments of agricultural policy – deficiency payments with their primary impact on production).

From the Figure 2, it may be seen that quantitative and price linkages among particular elements of this model guarantee that, regardless the originally considered direction of the impact, any change of any agricultural policy instrument will influence situation in all markets. However the extent of this impact will be generally different, depending on primary direction of measurement impact.

Besides, it is supposed that DP promote increasing returns of capital allocated in agriculture, have an influence on production differentiation in agricultural enterprises and at farms, have an impact on the extent of farmed land, however, they do not have direct influence on output decisions. In spite of the fact that various countries use different forms of implementation of direct income support, which may differ in efficiency, the indirect impact on output is characteristic for all forms of this type of support.

Because of the fact, that DP programs usually include some production restriction, the obtained results can be interpreted as the worst possible variant of final impact of particular policy measure. On the other hand, the best interpretation of support measures of this type would be the form with zero impact on output and trade and with efficiency of money transfer to agricultural producers equaled one.

Input subsidies enter between domestic demand and supply, reducing cost of agricultural producers. In case of price changes, the model also enables substitution of purchased inputs by farm owned inputs. The possibility of substitution depends on elasticities of input substitutions.

Market price support is defined as a political measure where the net effect is a difference between domestic and world price. This price difference can be included into price equations as a multiplicative or a difference adjustment to world prices. In the model, it is considered that this price difference influences both consumer and agricultural producer prices to the same extent. Besides, perfect reflection of world market price changes in domestic market is considered. However, in reality there are some barriers limiting perfect transmission of price signals from world markets. Including of this imperfect information would probably even deteriorate the final effect of price support measures.

CHARACTERISTIC OF THE PEM MODELS

In the OECD, center there are developed two PEM self-standing models, namely the PEM crop model and the PEM dairy model. These models have modul structures, i.e. every country or region participating in the global PEM project, which is being worked out in cooperation of the OECD center and in the project involved countries, has its own module. At present, 6 countries are participating in the PEM project: USA, Mexico, Canada, EU, Switzerland and Japan.

The PEM crop model contained originally only three commodities: wheat, coarse grains and oil seeds, which represented the most important commodities influencing world markets. Later, the fourth commodity rice extended this model.

The PEM dairy model was developed later and covers one part of animal production, namely raw cow milk and two aggregate milk products: manufactured dairy products (butter, cheese and SMP - skimmed milk powder) and fresh milk products (the other dairy products). Besides the PEM dairy model, the PEM animal production would contain in the future also the PEM meat model.

The Czech Republic entered in the PEM project through a team consisting of two working groups in VÚZE (Research Institute of Agricultural Economics, Prague) and MZLU (Mendel's University of Agriculture and Forestry, Brno). This team has obtained a grant project on the PEM model for the CR and contacted the OECD PEM team. The main goal of the Czech PEM team is to create self-standing Czech PEM modules usable for evaluation of the Czech agrarian policy. To this purpose, the Czech team has used and modified PEM EU modules whose structure is described in the following section.

MODEL PEM (POLICY EVALUATION MATRIX) FOR PLANT PRODUCTION

Description of the EU model

Denoting

- for commodities: W – wheat, C – coarse grains, O – oil seeds
- the symbol for commodities # = W, C, or O
- for factors: FE – fertilizers, HL – hired labor, OP – other purchased factors, LA – rent of land, FO – farm owned factors

A. Input (exogenous) support level

1. Market price support (MPS)

$$\text{EUMPST} = \text{EUMPST}_- + \text{MPS_EU}$$

a) b) c)

- a) the total market price support
- b) the sum of basic MPS's for W, C and O
- c) a change of the total MPS for EU

2. Output price support (OPS)

$$\text{EUOUTST} = \text{OUTS_EU}$$

a) b)

- a) the total output price support
- b) a change of the total output price for EU

3. Input support (IS)

$$\text{EUIST} = \text{EUIST}_- + \text{IS_EU}$$

a) b) c)

- a) the total support in input reduction
- b) starting stand of a)
- c) a change of the total EU input supports

4. Direct payments (DP)

$$\text{EUDPT} = \text{EUDPT}_- + \text{DP_EU}$$

a) b) c)

- a) the total direct payments
- b) starting stand of a)
- c) a change of the total DP sum in EU

5. Set aside (SA)

$$\text{EUSAT} = \text{EUSAT}_- + \text{SA_EU}$$

a) b) c)

- a) the total set aside
- b) starting stand of a)
- c) a change of the total set aside sum in EU

B. Input (exogenous) prices

6. Reference prices

$$\text{EU\#WP} = \text{EU\#PP_CON} + \text{US\#WP}$$

a) b) c)

- a) simulation value of the EU reference (world) price
- b) a constant difference between the world (US) and the EU reference price
- c) simulation value of the world (US) price

7. Producer prices

$$\text{EU\#PP} = \text{EU\#PP_CON} + \text{US\#WP}_- + \text{EU\#MPSR} + \text{EU\#OUTSR}$$

a) b) c) d) e)

- a) simulation value of a producer price
- b) a constant difference between the world price and the EU reference price
- c) starting value of the world price
- d) MPS rate
- e) share of output support

8. Consumer prices

$$EU\#CP = EU\#PP_CON + US\#WP_ + EU\#MPSR$$

a) b) c) d)

- a) simulation value of a consumer price
- b) a constant difference between the world price and the EU reference price
- c) starting value of the world price
- d) MPS rate

C. Support rates

9. Market price support rate

$$EU\#MPSR = EU\#MPSR_ + EU\#PSR*EU\#PP_$$

a) b) c) d)

- a), b) simulation and starting value MPS rate for the commodity #
- c) input value of the MPS unit change for EU for the commodity #
- d) starting EU producer price for the commodity #

10. Output price support rate

$$EU\#OUTSR = EU\#OUTSR_ + EU\#PP_$$

a) b) c)

- a) simulation value of output price support rate for the commodity #
- b) input value of EU output price unit change for the commodity #
- c) starting EU producer price for the commodity #

11. Set aside rate

$$EUN\#SAR = EUN\#SAR_ + EUN\#SAR$$

a) b) c)

- a) simulation value of set aside support rate
- b) starting value of set aside support rate
- c) input value of the total set aside support rate for the EU

12. Input reduction rate for FE (HL, OP)

$$EU\#FER = EU\#FER_ + EU\#RICR*EU\#FEDPI_$$

a) b) c) d)

- a), b) simulation and starting value of the input reduction rate for the factor FE
- c) input value of the reduction input unit change for the EU
- d) starting value of demand price index of the factor FE

13. Direct payment rate for LA

$$EU\#LAR = EU\#DPR_ + EU\#PR*EU\#LASPI_$$

a) b) c) d)

- a) simulation value of DP for the land factor (LA) for the commodity #
- b) starting value of the total DP rate
- c) input value of the DP unit change for the EU
- d) starting value of the supply price index for the land factor

14. Direct payment rate for FO

$$EU\#FOR = 0$$

a)

- a) simulation value of DP rate for the FO for the commodity #

D. Demand and supply

15. Commodity demand

$$EU\#QC = (EU\#WCP/EU\#WCP_)^{EU\#_W} * (EU\#CCP/EU\#CCP_)^{EU\#_C} * (EU\#OCP/EU\#OCP_)^{EU\#_O} * EU\#QC_$$

- a), k) simulation value and starting consumption amount of the commodity production #
b), c) simulation value and starting consumer price of wheat
d) demand elasticity for the commodity production # related to the price change of wheat
efg), hij) analogously as bcd) for coarse grains, oil seeds respectively

16. Factor demand price index for FO under zero profit condition

$$EU\#FODPI = (EU\#PP/EU\#PP_)^{(1/EU\#FO_SHR)} * (EU\#FEDPI/EU\#FEDPI_)^{(-EU\#FE_SHR/EU\#FO_SHR)} * \\ * (EU\#HLDPI/EU\#HLDPI_)^{(-EU\#HL_SHR/EU\#FO_SHR)} * \\ * (EU\#OPDPI/EU\#OPDPI_)^{(-EU\#OP_SHR/EU\#FO_SHR)} * \\ * (EU\#LADPI/EU\#LADPI_)^{(-EU\#LA_SHR/EU\#FO_SHR)} * EU\#FODPI_$$

- a), q) simulation value and starting demand price index of the factor FO for the commodity #
b), c) simulation value and starting producer prices of the commodity #
d) share of own factors of the commodity #
e), f) simulation value and starting demand price index of the factor FE for the commodity #
g) cost share of the factor FE for the commodity #
hij), klm), nop) analogously as efg) for the factor HL, OP, LA, respectively

Note, the fractions 1/d, -g/d, -j/d, -m/d, -p/d represent factor demand elasticities.

17. Commodity supply

$$EU\#QP = EU\#EX + EU\#QC$$

- a) simulation value production of the commodity #
b) input value of net export (export and import balance) of the commodity #
c) simulation value of production demand

18. Factor demand quantity by commodities for FE (HL, OP, LA, FO)

$$EU\#FE = EU\#QP / EU\#QP_ * (EU\#FEDPI / EU\#FEDPI_)^{(EU\#FE_SHR * EU\#FE_FE)} * \\ * (EU\#HLDPI / EU\#HLDPI_)^{(EU\#HL_SHR * EU\#FE_HL)} * \\ * (EU\#OPDPI / EU\#OPDPI_)^{(EU\#OP_SHR * EU\#FE_OP)} * \\ * (EU\#LADPI / EU\#LADPI_)^{(EU\#LA_SHR * EU\#FE_LA)} * \\ * (EU\#FODPI / EU\#FODPI_)^{(EU\#FO_SHR * EU\#FE_FO)} * EU\#FE_$$

- a), x) simulation and starting value of demand quantity of the factor FE for the commodity #
b), c) simulation and starting value of production quantity for the commodity #
d), e) simulation and starting value of demand price index of the factor FE
f) share of the factor FE in the total costs for the commodity #
g) demand elasticity of the factor FE related to the price change of the factor FE
hij), lmn), pqr), tuv) analogously as def) for the factors HL, OP, LA, FO, respectively
k), o), s), w) demand elasticity for the factor FE under the price change of the factor HL, OP, LA, FO, respectively

19. Factor demand quantity total for FE (HL, OP, LA, FO)

$$EUCPFE = EUWFE + EUCFE + EUOFE$$

a) b) c) d)

a) simulation value of the total demand quantity for the factor FE

b), c), d) simulation value of demand quantity for the factor FE related to the commodity W, C, O, respectively

20. Factor supply price indexes for FE (HL, OP, #LA, #FO)

$$EUFESPI = EUFEDPI + EUFER$$

a) b) c)

a) simulation value of the supply price index of the factor FE

b) simulation value of the demand price index of the factor FE

c) input value of the price change of the factor FE

21. Factor supply quantities for FE (HL, OP)

$$EUCPFES = (EUFESPI / EUFESPI)^{FEPO} * EUCPFES$$

a) b) c) d) e)

a), e) simulation and starting value of the supply quantity of the factor FE

b), c) simulation and starting value of the supply price index of the factor FE

d) demand elasticity for the factor FE

22. Factor supply quantities for LA

$$EU\#LAS = (1 - EUN SAR) * (EUWLASPI / EUWLASPI)^{\#LA_W} * (EUCLASPI / EUCLASPI)^{\#LA_C} * \\ * (EUOLASPI / EUOLASPI)^{\#LA_O} * (EU\#LAS / (1 - EUN SAR))$$

a) b) c) d) e) f) g) h)

i) j) k) l) m)

a), l) simulation and starting value of supply quantity of the factor LA for the commodity #

b), m) simulation and starting value of set aside rate

c), d) simulation and starting value of the supply price index of the factor WLA

e) demand elasticity for the factor #LA with respect to the price change of wheat (W)

fgh), ijk) analogously as cde) for CLA, OLA, respectively

23. Factor supply quantities for FO

$$EU\#FOS = (EU\#FOSPI / EU\#FOSPI)^{\#FOPF} * EU\#FOS$$

a) b) c) d) e)

a), e) simulation and starting value of supply quantity of the factor FO for the commodity #

b), c) simulation and starting value of the supply price index of the factor #FO

d) demand elasticity for the factor #FO with respect to the price change of the commodity #

E. Market equilibrium conditions

24. Market equilibrium conditions for commodities

$$EU\#AM = (EU\#QP - EU\#QC - EU\#EX)^2$$

a) b) c) d)

a) market equilibrium indicator (quadratic deviation) for the commodity #

b) simulation value of supply for the commodity #

c) simulation value of demand for the commodity #

d) input next export for the commodity #

25. Market equilibrium conditions for factors FE (HL, OP, #LA, #FO)

$$EUFEAM = 100 * (EUCPFES - EUCPFE)^2$$

a) b) c)

a) market equilibrium indicator (quadratic deviation) for the factor FE

b) simulation value of supply of the factor FE

c) simulation value of demand of the factor FE

- a) simulation value of the market farm income
 b), c) simulation value of supply quantity and demand price index of the factor WFO
 de), fg), hi), jk) and lm) analogously as bc) for the factors CFO, OFO, WLA, CLA, and OLA

33. Total farm income

$$\begin{aligned} \text{EUFI} = & \text{EUWFOS} * \text{EUWFOSPI} + \text{EUCFOS} * \text{EUCFOSPI} + \text{EUOFOS} * \text{EUOFOSPI} + \text{EUWLAS} * \text{EUWLASPI} + \\ & \text{a) b) c) d) e) f) g) h) i) } \\ & + \text{EUCLAS} * \text{EUCLASPI} + \text{EUOLAS} * \text{EUOLASPI} \\ & \text{j) k) l) m) } \end{aligned}$$

- a) simulation value of the total farm income
 b), c) simulation value of supply quantity and supply price index of the factor WFO
 de), fg), hi), jk) and lm) analogously as bc) for the factors CFO, OFO, WLA, CLA, and OLA

34. Production support estimate (PSE)

$$\text{EUPSE} = \text{EUTMPS} + \text{EUTOUTS} + \text{EUTDP} + \text{EUTIS}$$

a) b) c) d) e)

- a) simulation value of the total PSE
 b), c), d), e) simulation value of the MPS, OPS, DP, IS

35. Market equilibrium conditions for producer supports

$$\text{EUMPSTAM} = ((\text{EUMPST} - \text{EUTMPS}) / 100)^2$$

$$\text{EUOUTTAM} = ((\text{EUOUTST} - \text{EUTOUTS}) / 100)^2$$

$$\text{EUISTAM} = ((\text{EUIST} - \text{EUTIS}) / 100)^2$$

$$\text{EUSATAM} = ((\text{EUSAT} - \text{EUTSA}) / 100)^2$$

$$\text{EUDPTAM} = ((\text{EUDPT} - \text{EUTDP}) / 100)^2$$

- a) b) c)
 a) market equilibrium indicator for the supports MPS, OPS, IS, SA, DP
 b) input real value of the support
 c) simulation value of the support

36. Export subsidies

$$\text{EUEXSUB} = (\text{EUWCP} - \text{EUWWP}) * \text{EUWEX} + (\text{EUCCP} - \text{EUCWP}) * \text{EUCEX} + (\text{EUOCP} - \text{EUOWP}) * \text{EUOEX}$$

a) b) c) d) e) f) g) h) i) j)

- a) simulation value of the total export subsidies for wheat (W)
 b) simulation value of consumer price of wheat
 c) input reference (world) price of wheat
 d) input net export of wheat
 efg), hij) analogously as bcd) for C and O

37. Producer (farmer) supports

$$\text{EUTAX} = \text{EUTDP} + \text{EUTIS} + \text{EUTOUTS}$$

a) b) c) d)

- a) simulation value of the total farmer subsidies
 b) simulation value of the total direct payments
 c) simulation value of the total reduction input costs
 d) simulation value of the total output price support

38. Taxpayer expenditures

$$\text{EUNETAX} = \text{EUEXSUB} + \text{EUTAX}$$

a) b) c)

- a) simulation value of the total net expenditures of taxpayers

- b) simulation value of the total export subsidies
- c) simulation value of the total farmer subsidies

End of model

CONCLUSION

The structure of the described PEM crop model shows that the matrix contains 5 support types for the considered agricultural policy (MPS, OPS, IS, DP and SA), i.e. 5 rows, and 3 columns, transfers to farmers, impact on international trade and impact to taxpayer expenditures.

The key problems of the implementation of the PEM crop model to conditions of the Czech agriculture are estimates of basic model parameters – supply and demand elasticities (formula 15, 16, 18, 21, 22, 23) and calibration of the model for initial conditions – market equilibrium conditions for the basic year. Methodology of elasticities constructions is described in Foltyn, Froněk (2001) in this journal.

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The results of the research project NAZV on the methodology of application of EU farm typology in the Czech Republic

Výsledky řešení výzkumného projektu NAZV k metodice využití typologie zemědělských podniků EU v České republice

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Abstract: In the European Union, the detailed classification system and typology is used for the purpose of evaluation of farm structure and farm income. This system enables to determine and classify farms according to the economic size of farms and type of farming. The application of this typology is obligatory for the member states so it is necessary to start verifying it in the Czech Republic. Solving of methodology problems and creating of data preconditions of the application of this classification system in the CR was the main objective of the research project. The basic principles of the EU typology and results of the research project are presented in the article. The main methodological issues concerning of the application of EU farm typology in the Czech Republic were solved under the research project and the application of this typology was verified on the database of the FADN CZ survey 2000. The Standard Gross Margins CZ were calculated completely in correspondence with the EU methodology and are based on the latest cost surveys. It means that these values of SGM's can be used in the following three years. The development of software for purposes of this typology creates preconditions for efficient application of this methodology in agricultural statistics, policy analyses, etc. The project has proved that the application of this typology provides quite new and interesting approaches on analysing of farm structures and evaluation of their economic efficiency in respect of size of farm and orientation of production and creates the framework for comparison of the Czech farms with the EU ones.

Key words: Farm Accountancy Data Network (FADN), standard gross margin (SGM), economic size of farm, type of farming, European Size Unit (ESU), typology of farms

Abstrakt: Detailní klasifikační systém a typologie zemědělských podniků a farem je využívána v EU pro účely hodnocení struktur zemědělských podniků a jejich hospodářských výsledků. Tento systém umožňuje zařazovat zemědělské podniky podle jejich ekonomické velikosti a výrobního zaměření. Aplikování této typologie je závazné pro členské státy EU a je proto nutné ověřovat tuto metodiku v ČR. Hlavním cílem výzkumného projektu bylo řešit metodické problémy a vytvořit databáze a nástroje pro aplikaci této typologie v ČR. V odborné stati jsou prezentovány základní principy této typologie EU a výsledky řešení výzkumného projektu. Lze konstatovat, že hlavní problémy a metodické otázky aplikace této typologie v ČR byly v rámci výzkumného projektu vyřešeny a použití této klasifikace bylo ověřeno na databázi šetření FADN CZ 2000. Byly vypočteny standardní příspěvky na úhradu StPÚ zcela v souladu s metodikou EU na základě dat posledních tří šetření vlastních nákladů. To znamená, že tyto StPÚ mohou být využívány v následujících 3 letech. Vývoj software pro aplikaci této typologie vytváří předpoklady pro efektivní využití této metodiky v zemědělské statistice, analýzách agrární politiky, atp. Výzkum prokázal, že aplikace této typologie umožňuje nové a významné přístupy k hodnocení struktur zemědělských podniků a ekonomické efektivity z hledisek ekonomické velikosti podniků a výrobního zaměření a současně vytváří rámec pro srovnání s podniky EU.

Klíčová slova: zemědělská účetní datová síť FADN, síť testovacích podniků, standardní příspěvek na úhradu (StPÚ), ekonomická velikost podniku, typ výrobního zaměření, evropská velikostní jednotka (EVJ), typologie podniků

In the European Union, the detailed classification system and typology is used for the purpose of evaluation of farm structure and farm income. This system enables to determine and classify farms according to the economic size of farms and type of farming.

The typology was designed to meet in particular the information needs of the Common Agricultural Policy. The main purpose of the typology is to supply an instrument making possible, at the EU level:

- an analysis of the situation of holdings and farms based on economic criteria;
- comparisons of the situation of holdings according to the farm specialisation,
- comparison between the various size classes of farms;
- comparison between Member States or regions of the Member States;
- comparison between different time periods.

The applications of the typology principally comprise the presentation, by the type of farming and by the economic size class, of data collected through the Farm Structure Surveys (FSS) and the Farm Accountancy Data Network (FADN). This typology is used in basic documents of the CAP concerning the structures of farms and income situation of agricultural holdings.

The application of this typology is obligatory for the member states so it is necessary to start verifying it in the Czech Republic. Solving of methodology problems and creating of data preconditions for the application of this classification system in CR was the main purpose of the NAZV grant.

THE BASIC PRINCIPLES OF EU TYPOLOGY OF FARMS

The classification system and typology of the EU is based on the concept of Standard Gross Margin (SGM). The Standard Gross Margin of a crop or livestock item is defined as the value of output from one hectare or from one animal less the cost of variable inputs required to produce that output.

SGMs are calculated for all crop and livestock items in each country of the EU differentiated usually on regional basis and they are regularly updated according to the changes in production or input/output prices.

According to the area of different crops and number of animals the total farm SGM can be calculated for each farm. The value of the total farm SGM expresses the *economic size of farm*. The relative importance of SGM of each enterprise on total farm SGM enables to identify the farm according to the *type of farming*.

Definition of and principles for calculating SGM's

- The *gross margin* of an agricultural enterprise means the monetary value of gross production from which corresponding specific costs are deducted. The *standard gross margin* (SGM) means the value of gross margin corresponding to the average situation in a given region for each agricultural characteristic.
- Gross production* is the sum of the value of the principal product(s) and of the secondary product(s).
- In order to calculate SGM's, the following specific costs are deducted from the gross production:
 - In the case of crop production
 - seeds and seedlings (purchased or produced on the farm).
 - fertilisers purchased,
 - crop protection products,
 - various specific costs including:
 - water for irrigation purposes,
 - heating,
 - drying,
 - specific marketing costs (e.g. grading, cleaning, packaging), and processing costs,

- specific insurance costs,
 - other specific costs.
- In the case of livestock production
- livestock replacement costs;
 - feeding stuffs:
 - concentrated feeding stuffs (purchased or produced on the farm),
 - coarse fodder;
 - various specific costs including:
 - veterinary fees,
 - costs of natural service and artificial insemination,
 - costs relating to performance testing and the like,
 - specific marketing cost (e.g. grading, cleaning, packaging) and processing costs,
 - specific insurance costs,
 - other specific costs.

The following costs are not included in the specific costs to be deducted:

- costs of labour,
- machinery, buildings,
- fuel and lubricants,
- maintenance and depreciation for machinery and equipment,
- contract work.

However, costs of contract work related to renewal and removal of permanent crops and to crop drying are deducted.

Economic size classification

The economic size of the holding is determined on the basis of the total standard gross margin of the holding. The economic size of farm is expressed in terms of the European Size Units (ESU). The value of total farm SGM is expressed in EURO and transferred to ESU according to the formula:

$$1 \text{ ESU} = 1200 \text{ EURO}$$

The farms are classified into size classes given in Table 1.

Table 1. Economic size classes

Economic size class	Definition in ESU	Category of size
I	< 2	very small
II	≥ 2 and < 4	
III	≥ 4 and < 6	small
IV	≥ 6 and < 8	
V	≥ 8 and < 12	medium low
VI	≥ 12 and < 16	
VII	≥ 16 and < 40	medium high
VIII	≥ 40 and < 100	large
IX	≥ 100 and < 250	very large
X	≥ 250	extra large

Table 2. Classification of agricultural holdings by type of farming

General type of farming	Principal type of farming	Share in total farm SGM	Regrouping used in the EU Standard Results
1. Specialist field crops	13. Specialist cereals, oilseeds and protein crops	Cereals, oilseeds and protein crops >2/3	
	14. General field cropping	General crops >2/3; cereals, oilseeds, pulses and fallow land subject to set-aside incentive schemes with no economic use ≤2/3	
6. Mixed cropping	60. Mixed cropping	General cropping >1/3 but ≤ 2/3, or horticulture >1/3 but ≤ 2/3 or permanent crops >1/3 but ≤ combined with meadows and grazing livestock ≤ 1/3 and granivores ≤ 1/3	Arables
	– Market gardening and permanent crops combined		
	– Field crops and market gardening combined		
	– Field crops and vineyards combined		
	– Field crops and permanent crops combined		
– Mixed cropping, mainly field crops			
2. Specialist horticulture	20. Specialist horticulture	Fresh vegetables, melons, strawberries-market garden, outdoor and under glass, flowers and ornamental plants-outdoor and under glass and mushrooms >2/3	Horticulture
3. Specialist permanent crops	31. Specialist vineyards	Vineyards >2/3	Vineyards
	32. Specialist fruit and citrus fruit	Fruit and berries and citrus fruit >2/3	
	33. Specialist olives	Olives >2/3	
	34. Various permanent crops combined	Holdings in class 3, excluding those in classes 31, 32 and 33	
4. Specialist grazing livestock	41. Specialist dairying	Dairy cows>2/3	Dairy
	42. Specialist cattle – rearing and fattening	Rearing and fattening > 2/3	
	43. Cattle – dairying, rearing and fattening combined	Cattle > 2/3, dairy cows ≤ 1/10	Drystock
	44. Sheep, goats and other grazing livestock	Sheep, goats and other grazing livestock > 2/3	
5. Specialist granivores	50. Specialist granivores	Granivores i.e.: Pigs (i.e. piglets, breeding sows, other pigs), poultry (i.e. broilers, laying hens, other poultry) and does >2/3	Pigs and poultry
	– Specialist pigs		
	– Specialist poultry		
7. Mixed livestock holdings	71. Mixed livestock, mainly grazing livestock	Meadows and grazing livestock >1/3, but ≤2/3; nor other activity >1/3	Mixed
	72. Mixed livestock, mainly granivores	Granivores ≤ 2/3 but 1/3; general cropping ≤1/3; horticulture ≤1/3; permanent crops ≤1/3	
8. Mixed crops – livestock	81. Field crops – grazing livestock combined	General cropping >1/3; meadows and grazing livestock >1/3	
	82. Various crops and livestock combined	General cropping >1/3; granivores >1/3	

The type of farming, of a holding is determined by the relative contribution of different enterprises to its total standard gross margin.

Depending on the amount of detail required, the types of farming shall be divided into:

- general types of farming,
- principal types of farming,
- particular types of farming,
- subdivisions of certain particular types of farming.

These subdivisions shall be optional for those Member States in which the number of holdings in this type of farming is small.

For each type of farming, a special formula is defined which expresses the relative importance of different enterprises SGM on total farm SGM. The basic relations of the farm type classes on the two main levels of this typology are shown in the Table 2.

THE OBJECTIVES AND RESULTS OF THE RESEARCH PROJECT

Lots of methodological issues have to be solved and lots of data requirements are needed for the purposes of application of this typology in each country. Calculation of SGM's for different crop and animal enterprises is the basic problem and precondition of using this typology. The formulas for classification according to the type of farming classes are very complicated and have to be modified for each country. That is the reason why no common instrument or software is available for this procedures and some has to be prepared. Many other special cases should be solved in connection with this methodology. The research project NAZV was oriented on the following objectives:

- calculation of SGM's for the use in the Czech Republic,
- modifying of typology procedures and development of software for classification of farms,
- application of typology on the FADN CZ database.

The standard gross margin means the value of gross margin for crop or animal production unit corresponding to the average situation in a given region. The standard gross margins should be determined using average basic data about production and costs level calculated over a reference period of several years. They should be updated by taking into account the economic trends.

The research had to decide what will be regional differentiation of SGM's in CR and what data will be used for calculation of SGM's. The decision was made to calculate SGM's on two levels of break down. The republic averages of SGM's for each category of crop and animal production would be the first level. On the second level, SGM's will follow the production regions of our territory which reflect different agro-climatic conditions for agriculture. This means that for each production region, there were calculated SGM's of products which are produced in corresponding region.

The basic database available for the calculation of SGM's is the database of the cost survey that is regularly carried out by the Research Institute of Agricultural Economics in the FADN network. The averages of the last three survey data (1997-99) were used for this calculation. As the cost survey in the FADN does not cover all categories of crop and animal production needed in typology scheme, the special cost survey had to be organised for these marginal categories. The data available from cost surveys had to be converted into the structure of the EU categories of crops and livestock which are in some cases significantly different.

The level of gross production for each product was checked, compared and sometimes modified in correspondence with average values presented by the Czech Statistical Office from its surveys. The calculated values of SGM's CZ were compared with values in different EU countries.

The values of SGM's are presented and compared with average, minimum and maximum values in the EU countries in the Table 3.

Table 3. Values of Standard Gross Margins CZ (1997-99) in EURO

		Average CZ	Production region					SGM EU		
			Corn region	Beet region	Potato region	Potato-oats region	Mountain region	Average	Minimum	Maximum
D01	Common wheat and spelt	354	368	363	355	338	281	691	257	1 210
D03	Rye	289	264	275	309	293	274	481	133	1 090
D04	Barley	281	319	324	255	229	207	574	169	1 100
D05	Oats	249	229	232	263	266	254	513	179	1 090
D06	Grain maize	529	559	525	335			998	291	1 918
D08	Other cereals	229	245	251	213	208	200	626	155	1 277
D09	Pulses - total	193	178	182	203	206		796	269	2 440
D10	Potatoes	1 816	1 333	1 668	1 940	1 913	1 734	3 006	559	5 378
D11	Sugar beet	523	523	523	409			1597	608	2 750
D12	Fodder roots and brassicas	378	380	394	375	350	321	477	1	2 180

	Average CZ	Production region						SGM EU	
		Corn region	Beet region	Potato region	Potato-oats region	Mountain region	Average	Minimum	Maximum
D13B Hops	2 425	2 425	2 425				4 312	584	7 409
D13D1A Rape and turnip	317	283	297	335	340	307	591	222	1 033
D13D1B Sunflower	256	256	256				575	217	1 238
D13D1 Other oil-seed or fibre plants	430	430	430	430	430	430	587	271	1 385
D13D2 Aromatic-, medicinal and culinary plants	255	214	230	265	294		3 120	427	16 823
D13D3 Industrial plant – others	203		207	200	187		1 018	74	2 180
D14A Fresh vegetables, melons and strawberries - outdoor – open field	4 076	4 076	4 076	4 076			4 499	749	32 116
D14B Fresh vegetables, melons and strawberries – outdoor – market gardening	6 799	6 799	6 799	6 799			9 624	2 053	66 901
D15 Fresh vegetables, melons and strawberries – under glass	60 685	60 685	60 685	60 685			88 710	14 674	246 469
D16 Flowers – outdoor	6 936	6 936	6 936	6 936			27 507	1 212	84 610
D17 Flowers – under glass	48251	48251	48251	48251			143 277	19 272	519 599
D18 Forage plants – total	269	227	235	307	286	276	294	1	1 310
D19 Seeds and seedlings	230	230	230	230	230		3589	138	67 682
D20 Other crops	150	150	150	150	150	150	1288	102	19 997
F Permanent grassland and meadow – total	60	54	60	63	56	51	98	1	784
F01 Permanent grassland and meadow – pasture and meadow	60	54	60	63	56	51	256	1	1 260
G01 Fruit and berry plantations – total	1 613	1 892	1 892	1 424	1 191		4 835	1 113	21 467
G04 Vineyards – total	1 058	1 058	1 058				4 949	560	9 747
G05 Nurseries	5 800	5 800	5 800	5 800	5 800	5 800	26 317	2 390	114 867
G06 Other permanent crops	120	120	120	120	120	120	1305	96	8 896
I02 Mushrooms	2 897	2 897	2 897	2 897	2 897	2 897	19 409	3 156	1 386 000
J01 Forest	139	139	139	139	139	139			
J02 Equidae	245	245	245	245	245	245	176	15	2 000
J03 Bovine under one year old – total	99	99	102	102	94	89	145	36	429
J04 Bovine under 2 years – males	107	141	130	84	92	92	228	65	477
J05 Bovine under 2 years – females	61	73	64	61	51	48	139	4	771
J06 Bovine 2 years old and over – males	107	141	130	84	92	92	191	5	720
J07 Bovine 2 years old and over – heifers	68	74	66	64	82	78	197	4	2 459
J08 Bovine 2 years old and over – dairy cows	676	742	726	644	612	597	857	241	2 527
J09 Bovine 2 years old and over – other cows	259	274	274	211	324	323	256	95	849
J10 Sheep – total	19	15	15	15	27	27	54	3	146
J11 Goats – total	64	64	64	64	64	64	127	30	807
J12 Pigs – piglets under 20 kg	12	12	12	12	12	12	45	-52	170
J13 Pigs – breeding sows over 50 kg	253	261	261	222	305	305	254	116	849
J14 Pigs for fattening	83	80	80	82	91	91	54	-52	206
J15 Pigs – others	115	99	99	130	127	127	54	-52	206
J16 Poultry – broilers	37	28	28	49	30	30	103	15	230
J17 Poultry – laying hens	57	57	57	57	57	57	324	56	1 089
J18 Poultry – others	33	33	33	33	33	33	326	36	2 904
J19 Rabbits (breeding females)	31	31	31	31	31	31	32	18	94
J20 Beehives	16	16	16	16	16	16	48	16	183

Modifying of typology procedures and development of software for classification of farms

The procedures and formulas used for classification of the types of farming have to be modified according to the different conditions of each country. The different regional differentiation of SGM's is used, it is necessary to solve so-called special cases concerning the farms with unbalanced fodder situation, the classification of farms with significant non-agricultural and forestry production should be solved, etc. The approaches to solving these

issues are different in each country and the same topics had to be tackled for the Czech Republic.

As formulas for the classification of farms are very complicated, it was necessary to develop software for the efficient application of this methodology. The software developed under this project was designed for general application and will be used not only in the FADN network but also by the Czech Statistical Office for classification of results of the Agrocensus 2000 and could be used broadly in advisory service.

Table 4. Structure of the FADN CZ farm sample 2000 according to the economic size

Classes	Category of size	Legal entities				Individual farmers	Total
		agricultural cooperatives	business companies	other	legal entities total		
I	Very small					3	3
II	Very small					23	23
III	Small					43	43
IV	Small					36	36
V	Medium low					68	68
VI	Medium low					77	77
VII	Medium high		3	1	4	197	201
VIII	Large	1	14	2	17	127	144
IX	Very large	40	36	12	88	48	136
X	Extra large	235	232	9	476	11	487
	Total	276	285	24	585	633	1 218

Table 5. Structure of the FADN CZ farm sample 2000 according to the type of farming

Code	Principal type of farming	Legal entities				Individual farmers	Total
		agricultural cooperatives	business companies	other	legal entities total		
13	Specialist cereals, oilseeds and protein crops	4	20	3	27	225	252
14	General field cropping	7	15	5	27	91	1 118
20	Specialist horticulture					7	7
31	Specialist vineyards						
32	Specialist fruit		1		1	3	4
34	Various permanent crops combined						
41	Specialist dairying	14	13		27	53	80
42	Specialist cattle – rearing and fattening		1	1	2	23	25
43	Cattle – dairying, rearing and fattening combined	2	2	4	8	10	18
44	Sheep, goats and other grazing livestock	1	3		4	16	20
51	Specialist pigs	1	1		2	4	6
52	Specialist poultry	4	8		12	2	14
53	Various granivores combined		1		1		1
60	Mixed cropping	67	65	2	134	37	171
71	Mixed livestock, mainly grazing livestock	41	43	3	87	24	111
72	Mixed livestock, mainly granivores	20	25	2	47	2	49
81	Field crops – grazing livestock combined	102	73	4	179	114	293
82	Various crops and livestock combined	13	14		27	22	49
99	Specialist forest						
	Total	276	285	24	585	633	1 218

Application of EU typology on the FADN CZ database

FADN is the basic information system used in the EU countries for monitoring and evaluating of economic results and income situation of the farm. Standard results of the EU FADN for all member states are presented with use of the EU typology where farms are differentiated according to the economic size and type of farming. Under the project period the data of the FADN 1999 survey was used for verification of the developed methodology. The same application was carried out on the database of the FADN survey 2000 as presented in Tables 4–9.

The Tables 4 and 5 show the structure of the FADN 2000 farm sample according to the EU farm typology. We can compare the different structure of economic size for legal entities and individual farmers. The EU economic size classes do not fit too much to our legal entities as the most of them are classified in the biggest size class. As regards the type of farming, the individual farms are

much more specialised than the legal entities that are mostly classified in types of mixed farming.

In Tables 6–9, the comparison of economic results in the accounting year 2000 of different types and sizes of farms is shown. Only several simple economic indicators were used for illustration. The comparison of items from single entry accounting and double entry accounting is limited according to the different accounting methodology. The income results are calculated per 1 farm and also per 1 hectare.

From the point of economic size, there is the same tendency for legal entities and individual farms of better income results in correlation with increasing size of enterprise.

The results according to the type of farming provide an interesting view on economy of different farm orientation. The comparison between legal forms of farms is limited with regard to small number of specialised legal entities in the sample. The detail analyses of presented results of the FADN 2000 survey exceed the limits of this article.

Table 6. Income results of farms in the FADN 2000 by economic size per 1 ha in CZK

	Very small		Small		Medium low		Medium high	Large	Very large	Extra large
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.
<i>Legal entities</i>										
Number of farms							4	17	88	476
Total costs							18 866	15 892	24 727	38 516
Total revenues							17 034	16 512	25 821	39 675
Net income (loss/profit)							-1 832	620	1 094	1 159
<i>Individual farms</i>										
Number of farms	3	23	43	36	68	77	197	127	48	11
Total expenditures	6 961	11 513	12 954	13 950	14 619	13 714	16 322	21 189	19 834	39 711
Total receipts	6 190	1 0453	13 496	16 190	16 120	14 590	17 698	22 449	21 622	41 577
Net income (difference between receipts and expenditures)	-771	-1060	542	2 240	1 501	876	1 376	1 260	1 788	1 866

Table 7. Income results of farms in the FADN 2000 by economic size on 1 farm in thousands CZK

	Very small		Small		Medium low		Medium high	Large	Very large	Extra large
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.
<i>Legal entities</i>										
Number of farms							4	17	88	476
Total costs							3 853	7 603	18 424	69 478
Total revenues							3 479	7 899	19 239	71 569
Net income (loss/profit)							-374	296	815	2 091
<i>Individual farms</i>										
Number of farms	3	23	43	36	68	77	197	127	48	11
Total expenditures	104	210	282	398	533	772	1 447	3 439	8 647	25 938
Total receipts	93	190	294	462	588	821	1 569	3 644	9 426	27 157
Net income (difference between receipts and expenditures)	-11	-20	12	64	55	49	122	205	779	1 219

Table 8. Income results of farms in the FADN 2000 by type of farming per 1 ha in CZK

	General field cropping	Horticulture	Milk	Grazing livestock	Granivores	Various crops&livest. combined
Legal entities						
Number of farms	188		27	14	15	340
Total costs	39 183		36 692	16 514	51 466	36 375
Total revenues	40 532		37 506	17 297	52 200	37 460
Net income (loss/profit)	1 349		814	783	734	1 085
Individual farms						
Number of farms	353	7	53	49	6	162
Total expenditures	20 781	48 868	24 529	8 369	96 536	20 273
Total receipts	21 970	53 020	27 370	10 334	104 701	21 786
Net income (difference between receipts and expenditures)	1 189	4 152	2 841	1 965	8 165	1 513

Table 9. Income results of farms in the FADN 2000 by type of farming per 1 farm in thousands CZK

	General field cropping	Horticulture	Milk	Grazing livestock	Granivores	Various crops&livest. combined
Legal entities						
Number of farms	188		27	14	15	340
Total costs	63 203		43 954	19 425	75 847	59 786
Total revenues	65 379		44 929	20 346	76 929	61 569
Net income (loss/profit)	2 176		975	921	1 082	1 783
Individual farms						
Number of farms	353	7	53	49	6	162
Total expenditures	2 780	1 313	1 880	977	8 696	2 202
Total receipts	2 939	1 424	2 098	1 206	9 432	2 366
Net income (difference between receipts and expenditures)	159	111	218	229	736	164

SUMMARY

The main methodological issues concerning the application of the EU farm typology in the Czech Republic were solved under the research project and the application of this typology was verified on the database of the FADN CZ. The SGM's CZ were calculated completely in correspondence with EU methodology and are based on the latest cost surveys. It means that these values of SGM,s can be used in following three years. The development of software for purposes of this typology creates preconditions for efficient application of this methodology in agricultural statistics, policy analyses, etc. The application of this typology provides quite new and interesting approaches to analysing farm structures and evaluation of their economic efficiency in respect of size of farm and orientation of production and creates the framework for comparison of Czech farms with the EU ones. There are also some limits of the impact of this methodology as the majority of Czech big agricultural enterprises – legal entities are classified in the biggest size class and are oriented on mixed farming.

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Methodological techniques for construction and statistical analysis of supply and demand elasticities in agriculture sector models

Metodické postupy konstrukce a statistické analýzy elasticit nabídky a poptávky v sektorových modelech zemědělství

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Abstract: This article deals with the methodology for the construction of elasticities in the partial market equilibrium models in agriculture. Within such models, ESIM, AGLINK, PEM, and MFSS99 are the best-known ones worldwide, whereas in the Czech Republic, it is that of AGRO-3. These models are based on constructing supply and demand functions that are grounded on price elasticities representing the sensitivity of supply and demand quantities in agriculture to prices changes of agricultural commodities, or inputs. This article shows two methods for the construction of elasticities, both developed by the authors in VÚZE (Research Institute of Agricultural Economics). The method 1 is based on minimization of quadratic differences. The method 2 for constructing direct price and income elasticities from ratio differences uses Frisch's theory for the construction of cross elasticities. Furthermore, problems of uniqueness and non-uniqueness in the construction of elasticity matrices are examined and criteria for a statistical equivalence of these matrices are suggested, grounded on the paired t-test and cluster analysis.

Keywords: economic-mathematical models in agriculture, partial market equilibrium, prediction, supply and demand functions, elasticities, methods for construction of elasticities, statistical equivalence, paired t-test, cluster analysis

Abstrakt: Článek se zabývá metodikou konstrukce elasticit v modelech tržní rovnováhy v zemědělství. Tyto modely, mezi nejznámější z nich patří ve světě např. ESIM, AGLINK, PEM a MFSS99 a v ČR model AGRO-3, jsou založeny na konstrukci nabídkových a poptávkových funkcí opírajících se o cenové elasticity, vyjadřující citlivost nabídkových a poptávkových veličin v zemědělství na změnu cen agrárních komodit, příp. vstupů. V příspěvku jsou uvedeny dvě metody konstrukce elasticit, vyvinuté autory ve VÚZE, a to metoda 1, založená na minimalizaci kvadratických odchylek, a metoda 2 pro konstrukci přímých cenových a příjmových elasticit poptávky z poměrných diferencí, opírající se o Frischovu teorii konstrukce křížových poptávkových elasticit. Dále jsou zkoumány problémy jednoznačnosti a víceznačnosti konstrukce matic elasticit a jsou navržena kritéria statistické ekvivalence těchto matic, opírající se o párový t-test a clusterovou analýzu.

Klíčová slova: ekonomicko-matematické modely zemědělství, dílčí tržní rovnováha, predikce, nabídkové a poptávkové funkce, elasticity, metody konstrukce elasticit, statistická ekvivalence, párový t-test, clusterová analýza

Agricultural sector models, usually considered as macroeconomic models of partial market equilibrium (PE models), are used to simulate agricultural trends and impact of various measures in agricultural policy. These models start with an analysis of previous trends and they allow the forecasting of expected development of the agricultural sector for a given time period thanks to certain exactly defined assumptions. As they search for the state of equilibrium between supply and demand within agricultural markets, these models are also called supply and demand models.

PARTIAL MARKET EQUILIBRIUM MODELS

The most common models of that kind are the following: the ESIM model (a PE simulation model of the EU agriculture related to the world agricultural market which

is developed at the Goettingen University), the AGLINK model (a PE model for the worldwide agricultural markets which is developed by the OECD and targets to its member-states' agriculture), the PEM model (a PE model evaluating the impact of agricultural policy changes of one country on the balance in world agricultural markets, developed also by the OECD), the MFSS99 model (a PE model of individual EU member-states, developed at the Bonn University), and finally the AGRO-3 model (a PE model for the market equilibrium in the agricultural sector, i.e. within agricultural primary production, food processing, food retail and food consumption, developed in the Research Institute of Agricultural Economics, Prague, which is used besides the Czech Republic also in the Slovak Republic and in Lithuania).

All above mentioned the models are grounded on the supply and demand functions for chosen agricultural commodities. In the Table 1, which gives their overview,

Table 1. Supply and demand functions in PE models

Model	Supply functions	Demand functions
ESIM	1) supply of commodity production (y_i), given by APP (x_j) and feed costs (x_j)	1) demand for final agricultural production (y_i), given by APP (x_j) and population income (x_j) 2) demand for fodder (y_i), given by the APP's of raw feeding material (x_j) and the coefficients of normative feed consumption in different categories of animals (x_j)
AGLINK	2) supply of yield areas (y_i), given by the market prices (x_j) of plant commodity production in the previous year 3) supply of milk and meat products (y_i), given by the APP of these products	3) demand for the final production of chosen commodities (y_i), given by the world market prices (x_j) and the population income (x_j) 4) demand for fodder (y_i), given by the prices of feed resources and feed costs (x_j)
PEM	4) supply in the amount of cost factors (y_i), given by the supply prices (x_j) of cost factors 5) supply production functions are not explicitly specified	5) demand for final production (y_i), given consumer prices (x_j) 6) demand for cost factors (y_i), given by the demand prices of factors (x_j)
MFSS99	6) supply of activity levels (y_i), i.e. of areas and heads of animals, given by market prices and production support level (x_j) 7) supply of the production volume of selected commodities (y_i) in the manufacturing industry, given by the APPs of input agricultural raw material (x_j)	7) demand for fodder (y_i), given the market prices of fodder or its components (x_j) and the production volume of animal products (x_j) 8) demand for final production (y_i), given consumer prices (x_j) and consumer expenses (x_j)
AGRO-3	8) the supply functions of commodity production are not explicitly specified	9) demand of an average consumer for food products (y_i), given by the consumer prices of food products (x_j), population income (x_j), and consumer's non-food expenditure (x_j)

the y_i 's are dependent variables whereas the x_j 's are independent ones (APP stands for "agricultural producer prices").

ELASTICITIES AS KEY PARAMETERS IN PE MODELS

The general structure of all the supply and demand functions mentioned above is as follows: given m , the number of agricultural commodities, and n , the number of factors influencing the supply level (production) or the demand level (consumption) of that production. The following system of equations describes relations between these commodities and factors:

$$Y_i = K_i \times P_1^{E_{i,1}} \times P_2^{E_{i,2}} \times \dots \times P_n^{E_{i,n}} \quad (1)$$

for $i = 1, \dots, m$

where Y_i is a dependent variable representing supply or demand for the given commodity, K_i is a constant factor of the given function, P_1, P_2, \dots, P_n are independent variables – factors (usually prices) – explaining the level of the variable of Y_i , and $E_{i,1}, \dots, E_{i,n}$ are constants (supply or demand elasticity) expressing the rate of influence of the individual factors on the value of the Y_i variable. Note that, as to the supply functions, m is often equal to n .

In the economic theory, the elasticity means a sensitivity of values of one variable to changes in values of

other variable. In particular, the price elasticity of supply or demand expresses (or measures) reaction of the supplied or demanded amount of commodity to price changes (Samuelson, Nordhaus 1991). Direct elasticities represent reactions of the supplied or demanded amount of a given commodity to factor (price) changes for the same commodity, whereas cross elasticities represent reactions of the supplied or demanded amount of one commodity to factor (price) changes of another commodities.

Thus to determine elasticity values, so that a particular form of supply and demand functions can credibly depict the modeled reality, represents a key question for trustworthiness and applicability of each model mentioned above. Moreover, the elasticities should comply with the following conditions, according to the economic theory of supply and demand:

Condition C1: In a supply function, the following relations hold:

$E_{ii} > 0$ for direct elasticities and $E_{ij} \leq 0$ ($i \neq j$) for cross elasticities,

whereas in demand functions, the opposite relations hold:

$E_{ii} < 0$ for direct elasticities and $E_{ij} \geq 0$ ($i \neq j$) for cross elasticities.

Condition C2: The supply and demand elasticities should comply with the conditions of homogeneity, i.e.:

$$\sum_j E_{ij} = 0 \quad \text{for all } i.$$

Condition C3: The supply and demand elasticities should comply with the conditions of symmetry, i.e.:

$$E_{ij} \times (P_i \times Y_i) / \sum_k (P_k \times Y_k) = E_{ji} \times (P_j \times Y_j) / \sum_k (P_k \times Y_k) \text{ for } i \neq j.$$

METHODS FOR CALCULATION OF MODEL ELASTICITIES

Method 1

Suppose that there is a time series of independent variables $P_1(t), P_2(t), \dots, P_n(t)$ and dependent variable quantities $Y_1(t), Y_2(t), \dots, Y_n(t)$ for a given time period (usually representing individual years) $t = 1, 2, \dots, k$.

Once these data are substituted to the equation (1), we obtain the following formulas

$$Y_i(t) = K_i \times P_1(t)^{E_{i1}} \times P_2(t)^{E_{i2}} \times \dots \times P_n(t)^{E_{in}} + \delta_{i,t} \text{ for } i = 1, \dots, m \text{ and } t = 1, 2, \dots, k, \quad (2)$$

where $\delta_{i,t}$ is a degree of non-fitting for the i -th equation (stochastic quantity) at the moment t after substituting the actual data to the equation (1). Considering the parameters K_i and E_{ij} in the equations (2) as unknown quantities, we can obtain their values if we try to solve the following optimization problem:

Problem U1: Find a minimum value of the following objective function

$$\sum_{i,t} \delta_{i,t}^2,$$

related to the variables K_i and E_{ij} for $i = 1, \dots, m$ and $j = 1, \dots, n$, where $\delta_{i,t}$ comply with the equation system (2) and meet the conditions C1, C2, C3.

Having substituted the calculated values for the constants K_i and elasticities E_{ij} , we shall get the wanted system of supply and demand equations for one of the models described above with the best fitness of the reality development during the time period of $t = 1, \dots, k$ in the area of supply-demand relationships.

Note that since the number of unknown quantities K_i and E_{ij} is usually considerably greater than the number of equations and as the given time period is usually short (merely several years), it is possible to formulate more additional conditions for the looked up quantities as e.g. a range for the elasticity values. This implies that the problem U1 of searching for elasticities is not unique, or that there exists more than one elasticity matrix which complies with the problem U1.

Method 2

As in the distinction from the method 1, some approaches are grounded on the calculation of merely se-

lected elasticities, out of which the other elasticities are derived under the condition of using certain theoretical assumptions or requirements.

The method 2 (Frisch 1959) falls into the class of such approaches. It is applied in the model of AGRO-3 for the calculation of food consumption (i.e. consumer demand for food products), given by the trends in food consumer prices. In order to determine the whole matrix of elasticities, this method requires only direct income elasticities, direct demand consumer price elasticities (on condition of preferential independence) and the share of individual commodities on the total consumption. According to Frisch, the cross elasticities are to be calculated using the following formula:

$$E_{ij} = -I_j \times A_j \times (1 + E_{jj}) / (1 - I_j \times A_j) \text{ for } i \neq j \quad (3)$$

where E_{ij} means the cross demand elasticity for a commodity (aggregate) i relating to the price change of a commodity (aggregate) j , E_{jj} is the direct demand price elasticity for the commodity j , I_j, A_j represent direct demand income elasticities for the commodities i and j , respectively, and A_j is the share of the commodity j in the total consumption.

Frisch's theory involves the exogenous specification of the elasticities I_j and E_{jj} for each commodity j . Thus, in the demand elasticity matrix, the direct elasticities E_{jj} are found on the diagonal while the cross elasticities, determined according to the formula (3), are off the diagonal. Note that the Frisch's elasticity matrix complies with the condition C1 only as to the above-mentioned theoretical conditions C1, C2, and C3 on elasticities. On the other hand, Frisch's theory comes out from the general theory of elasticities, which guarantees that non-complying with the conditions C2 and C3 by a Frisch's elasticity matrix is "very small", as practical tests prove.

From the point of view of the method 2, direct elasticities are of an essential importance within the set of input parameters. They are usually determined by the linear regression analysis in the logarithmic transformation of a dependent variable (consumption) and independent variables (income-product; price). In view of the character of available statistical series (short length, possible radical changes in parameters, and therefore in elasticities as well), it is often necessary to choose another solution. A way out is approximating the size of elasticities that are calculated using the economic definition of elasticity and its econometric realization by the substitution of derivatives with the respective ratio differences. Here it is possible to start with the left or right proportional differences or to apply the geometrical mean of the two elasticities calculated in this manner, as shown below.

In order to simplify the task, let us suppose that there are three pairs of the values of independent and dependent variables in the three successive time moments. Denoting these pairs by (x_i, y_i) for $i = 1, 2, 3$ (here x and y means an independent and dependent variable, respectively), the following relations hold:

For the left elasticity

$$\eta_L = (x_2 / y_2) \times (y_2 - y_1) / (x_2 - x_1),$$

and for the right elasticity

$$\eta_P = (x_2 / y_2) \times (y_3 - y_2) / (x_3 - x_2).$$

The searched up elasticity value is then geometrical mean of both elasticities, calculated as the square root of their product (if there exists), i.e.

$$\eta = (\eta_L \times \eta_P)^{0.5}.$$

As the model was being permanently analyzed and specified, the elasticities were further modified appropriately with experts estimates, with backward calculations to the past and also with the help of contingency tables related to statistical monitoring of the food consumption of the representative sample of households.

METHODICAL PROBLEMS OF ELASTICITIES CONSTRUCTION

When determining elasticities on the base of the statistical material, one should take into consideration the fact that their estimates are considered as a random quantity, i.e. the figure taken for elasticity is the realization of a random variable with a certain dispersion. On the other hand, the results of model computations are considerably sensitive to even small changes in the size of individual elasticities. Therefore, the estimation of elasticities, which is carried out on the base of a statistical procedure, either a regression analysis, or an approximation procedure, is merely the first starting step for further adjustments. It is appropriate to carry them out using the "forecasting" of results already known (and achieved).

For this purpose, it is also possible to use some results of the econometric theory. However, certain necessary modifications can occur also here. They follow from the nature of modeled phenomena and actually have an empirical character.

In order to determine the price elasticities of supply, Chatelier's principle can be used. Let us mark the supply elasticities for short-term predictions, middle-term predictions and long-term predictions with ES_1 , ES_2 , and ES_3 respectively. Then according to Chatelier's principle, the following holds:

$$|ES_1| < |ES_2| < |ES_3|.$$

When the predictions carried out by the model AGRO-3 were analyzed, the price elasticities of consumption, marked with ED_1 , ED_2 , and ED_3 from the point of view of their prognostic usability, appeared sometimes to satisfy

$$ED_1 < ED_2 < ED_3 < 0.$$

Hence this feature was used to specify the size of elasticities with competence of the higher stability with re-

gard to time. Although it is not suitable or useful to consider them as generally useful, their application can often be advantageous.

There are many reasons among which there can be considered e.g. computable ability, why the assumption on constant elasticities (which are independent on the level of variables) is admitted. This is also connected to the fact that the applied econometric (supply and demand) functions have the form of a general power, which implies that they are linear in logarithms. This assumption, however, can appear as a methodical restriction in practice. In this context the classical statement by A. Marshall should be reminded as he mentioned it in his reflections on "elasticity of wants" in his work Principles of Economics:

"The elasticity of demand is great for high prices, and great, or at least considerable for medium prices; but it declines as the price falls; and gradually fades away if the fall goes so far that satiety level is reached. This rule appears to hold with regard to nearly all commodities and with regard to the demand of every class."

Thus the constancy of elasticities is bound only to a certain price area and when carrying out the computations with prices on the boundary of or outside this area, it is necessary to take into consideration the considerably more approximate character of individual elasticities.

STATISTICAL EQUIVALENCE OF ELASTICITIES

Using economic-mathematical models, which assume elasticity sets as model parameters, it is useful to test relations among elasticity sets corresponding to individual model variants. These sets can be conditioned either by different time horizons, or by different methodological approaches of the elasticity construction for the same time horizon.

Considering the stochastic character of computed (or estimated) elasticities, it is evident that the elasticity vectors described above will differ from each other in individual elements. However, in the modeling activity it is necessary to determine a certain statistically considered equivalence.

For the assessment of the relation between two elasticity vectors, it is possible to use the paired t-test. The difference among vectors is considered as a vector of differences among coordinates of these vectors. For testing is the statistically unimportant difference between two considered vectors, it has to be tested if the difference vector is a choice from the normal probability distribution with the zero mean. It is known, that the paired t-test excludes the influence among elements of individual vectors (e.g. the existence of trends, or the existence of function relations, etc.). This fact is very useful for elasticities corresponding to different commodities. Note, on the other hand, that the assumption about the same dispersion for individual differences can be problematic.

Therefore, there were considered still other methods, which do not depend on this assumption. For classifica-

tion (or ordering) of the set of elasticity vectors, using cluster analysis is assumed. In this case, individual vectors would be ordered into clusters, which would create classes of the parameter equivalence and they would be used for the assessment of the similarity among models corresponding to elasticities (i.e. to model parameters) ordered in one of the clusters. The advantage of this approach is even parallel evaluation of the bigger number of the examined elasticity vectors. In addition, it enables comparing the elasticity vectors generated by different methods and assessing possible model improvement. The sensitive point of this approach is determining the number of clusters. By the suitable option of different variants, it is possible to obtain interesting views into the structure of the "relationship" of different elasticity vectors. In the case of elasticities generated by the method 1, it is possible to classify the influence of range changes on the computed elasticity vectors.

From the "technical" reasons, it is more advantageous to use both discussed methods (i.e. paired t-test and cluster analysis) for direct elasticities. However, these methods can be used for the whole elasticity matrices, or their parts, which are considered in both case as vectors.

Actually, in the VÚZE both approaches are tested from the point of view of the statistic equivalence for the direct elasticities of the model AGRO-3 generated by the methods 1 and 2.

CONCLUSION

Construction of elasticities usable in PE models is a synthetic problem. It is necessary to come out from the logical assessment of their dynamics and the numerical size in relation with the economic interpretation, where it is possible to apply the experience and knowledge of experts. It is necessary to state that the methods described in this article for computing and evaluating of model elasticities do not exclude the necessity of their permanent verification, or updating.

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Analysis of agricultural incomes diversification in the framework of the IDARA project in the Czech Republic

Analyza diversifikace zemědělských příjmů v České republice v rámci projektu IDARA

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Abstract: The article deals with the diversification process of agricultural income in the Czech republic. Diversification in agriculture is a part of the research project IDARA. The aim of this project is to identify key problems and to discuss strategies for the integrated development of agriculture and rural areas in the first group of Central and Eastern European Countries acceding the EU. Some preliminary presumptions for analysis of diversification are introduced and the first results obtained are compared with these presumptions.

Key words: diversification, non-agricultural income, employment, rural development

Abstrakt: Článek se zabývá procesem diversifikace zemědělských příjmů v České republice. Diversifikace v zemědělství je jedna část výzkumného projektu IDARA. Cílem tohoto projektu je identifikovat a popsat hlavní problémy v zemědělství a venkovských oblastech v zemích střední a východní Evropy, kteří se ucházejí o členství v EU a zároveň navrhnout vhodné strategie pro jejich rozvoj. Nejdříve jsou uvedeny výchozí předpoklady pro analýzu diversifikace a následně první získané výsledky porovnány s úvodními předpoklady.

Klíčová slova: diversifikace, nezemědělský příjem, zaměstnanost, rozvoj venkova

INTRODUCTION

The aim of the research project IDARA is to identify key problems and to discuss strategies for the integrated development of Agriculture and Rural Areas in the first group of Central and Eastern European Countries (CEEC) acceding the EU. This project involves the Czech Republic, Poland and Hungary. The combined research to be undertaken by the project will cover 3 main objectives, namely:

- a) To develop a methodology for evaluating the impact of rural development policy measures and to identify the best practice in institutional structures in the implementation these measure in the EU and to evaluate to what extent these measures and structures can be adapted to meet the current needs of the CEEC.
- b) To develop existing knowledge on factors determining competitiveness, non-agricultural income and the nature and constraints on farm enterprise diversification in the CEEC. This will help to develop strategies that enhance the potential role of agricultural diversification as a rural development factor.
- c) To develop a simulation model for the CEEC that allows a comprehensive analysis of the impact of alternative

policy scenarios on production, consumption, net trade, income, and budget, and that ensures compatibility with the EU SPEL/MFSS.

Results of all research areas by country will be integrated, in order to provide a broad and comprehensive picture of the particular conditions and problems faced by each country, and to propose strategies and policy recommendations that reflect this specificity.

Another important objective is the enhancement of cooperation between the EU and CEEC researchers and transfer of know-how to the CEEC with a view to support the enlargement process.

DIVERSIFICATION – A PART OF THE PROJECT, OBJECTIVES, METHODOLOGY

The Czech villages are currently in a process of far reaching change demonstrated by the restructuring of agriculture and by transformation of agricultural enterprises into optimal economic size. The reduction of agricultural production has resulted in falling down of the number of workers in this sector. Rural regions and the world of farmers with which it has close ties, are experi-

encing economic and socio-cultural structural transformation. The reasons for this are partially due to the lack of jobs, the income situation in agriculture and commercial enterprises, social deficits in families, as well as in village communities. This still results in the tendency to migrate and can/must not be tolerated. Today, the role of rural areas is the essential element of every regional development and as such, it must be placed at the centre of regional political developments. Approximately 75 per cent of the country can be classified as rural and there live about 22 percent of the population in these rural regions (SAPARD 2000, the indicator is calculated according to the OECD methodology on the NUTS 5 level). There is no reason that the number of workers in the agricultural production will increase in the next few years.

Each entrepreneur is responsible for his enterprise in market economy so each farmer has to be able to ensure a sufficient income from his business for his family, labour and factors (capital). If there is not enough opportunity for generating income from agricultural activities, it may come to that the farmer has to look for any additional income source of income. For example, he might wish to diversify the production structure. Diversification is a wide term which can be interpreted in the different meanings. Its understanding ranges from growing plants for a non-food utilisation, processing raw materials, engagement in traditional handicrafts and agro-tourism often marked as diversified on-farm activities to off-farm investments or jobs. The importance of diversification has always been recognised, we may argue that this phenomenon was quite common in the collectivised agriculture (Ratinger, Rabinowicz 1997), however, little systematic research has been done in this direction. Problems of diversification can be seen not only within the process of restructuring of the agricultural enterprises but all countryside is shaped by farm enterprise diversification. Diversification of production structure aids to reverse the trend of population migrating from rural regions into towns, to fight against poverty, to promote equal employment opportunities, to find solutions to increasing demands regarding quality, health, security, personal development, and recreation in order to better improve living conditions in rural areas. We have to keep in mind that rural regions fulfil an important provisional, recreational, and balancing function which is increasingly in demand for and utilized in our modern society.

As stated above, farm diversification (or its absence) has a key impact on the economic development of rural areas. An adequate understanding of the sources and the factors shaping its level and success will help to define actions that help to enhance the role of farm diversification for rural development purposes. Farm diversification research is carried out simultaneously with the assessment of farm competitiveness within one part of the IDARA project. Obviously, farm diversification is directly linked to the competitiveness of agricultural activities. If a farmer is able to hold a position in the market against competitors then he is neither driven nor willing to enter

into a new activity or to start a new business. The lower is agricultural income the higher is propensity to participate in non-agricultural activities (if they are expected to be more profitable).

- The research tries to investigate the following issues:
- What is the degree of farm enterprise and farm household income diversification in the Czech republic?
 - What are the types of non-agricultural activities in which the farm enterprises and households engage?
 - What are the key structural and agency factors shaping the choice to participate in diversification, the level and success of diversification.
 - What are the main constraints to diversification during transition?
 - What are the lessons of the best practice and the limits to extend them?
 - What are the policy options for facilitating diversification of farm enterprises and household income? (Davidova et al. 2000)

DIVERSIFICATION INCOME SOURCES

Agricultural core activities can be defined as activities taking place in predominantly agricultural proprietorial units and based on the primary production of food, feed or fibre. (Slee 1986). Agricultural diversification can be then defined as all other gainful activities by farmers outside the agricultural core activities. The other definition explains diversification as a strategy of utilising excess capacity of production factors, which are subject to market failure (Montgomery and Wernerfelt 1988). Thus, if there is no utilisation of surplus factors such as labour, land or capital in agricultural production, extra output (income) may be generated from them by putting these factors in an on-farm non-agricultural enterprise. This may be more or less of interest for the Central and Eastern European Countries where land and capital markets are still in the process of development. Diversification includes five potential sources of income: non-agricultural on-farm enterprises, non-farm enterprises, non-agricultural employment, non-home farm agricultural employment, and unearned income. The possible sources of additional income for farmers are thus diverse and the farmer could move away from farming without setting up new enterprises (for example, by gaining additional employment). These possible sources of income are distinguished in Figure 1.

Individual farm households have more avenues for diversification than corporate farms. They can diversify through employment and through extending their enterprise activities outside agriculture. Basically, diversification can be divided into on-farm and off-farm. Diversified enterprises running on-farm may be accommodation, agro-tourism, etc. On the other side diversified activities running off farm may be either participation in non-farm enterprises (for example car services, accountancy agency) or employment (outside/inside agriculture).

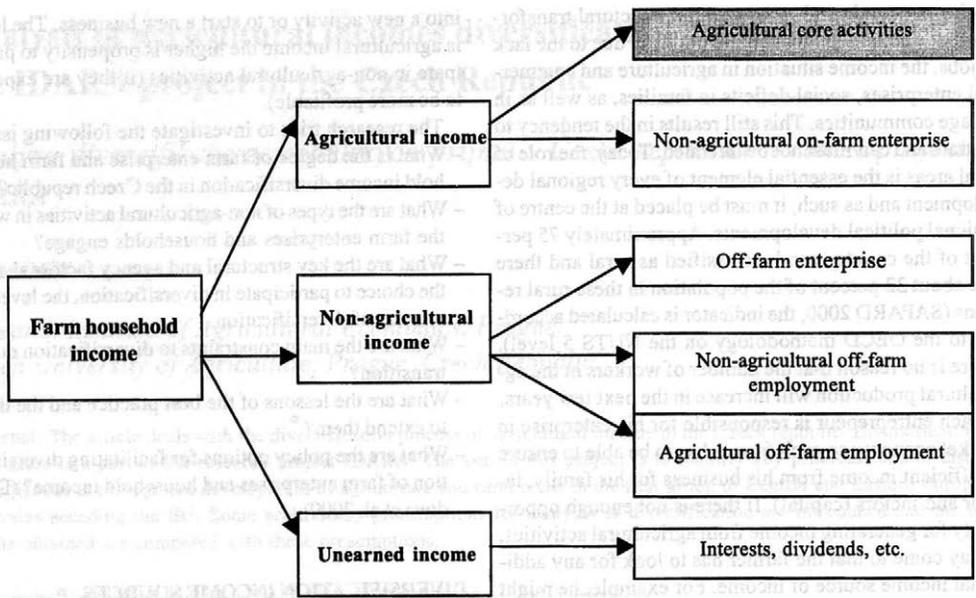


Figure 1. The potential sources of farm household income

Source: Analysis of Diversification of Farm Enterprises and Household Income in CEECs

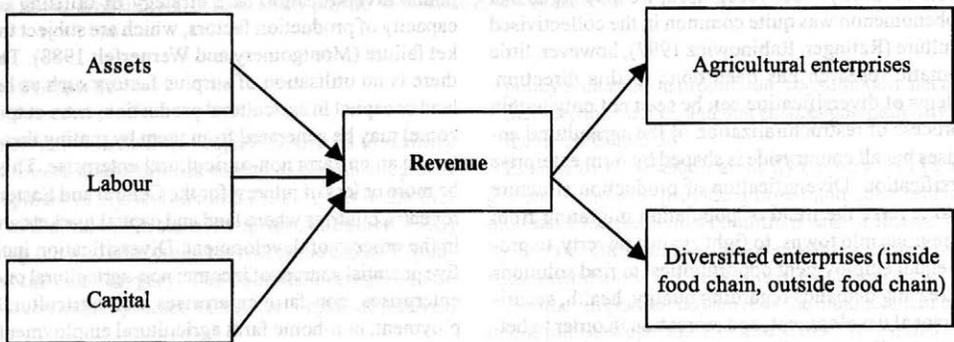


Figure 2. The potential sources of enterprise income in legal entities

Source: own

Legal entities may create additional income (Figure 2) only from diversified enterprises (inside food chain and/or outside food chain).

One of the main task of this part of project is to identify key factors influencing the choice to participate in diversification. These factors will be reviewed in this paragraph. The main factors shaping the participation in diversification are shown in Figure 3. There are several factors which can influence the decision to diversify. The factors were acquired within the survey conducted in the

foreign countries (Chaplin 2000). Therefore, all factors would not be relevant for Czech farms. Some factors might have a stronger impact on the process of diversification whilst the others do not. Many of these factors are socio-economic characteristics of the farm household. These affect the choice of farm and non-farm activities either via a farmer characteristic or by influencing attitude to risk (Feinerman and Finkelshtain 1996). Risk will be discussed separately to the socio-economic factors.

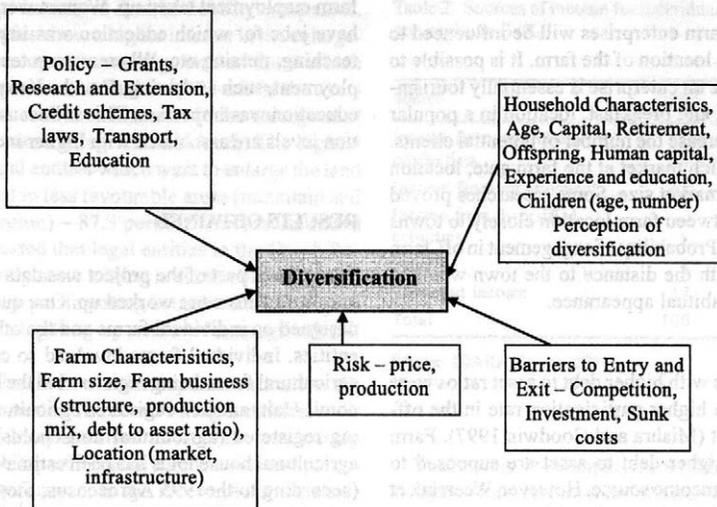


Figure 3. Factors influencing diversification

Source: Presentation of Diversification of agricultural incomes, Annual Meeting of the IDARA project, Hannah Chaplin, Budapest, March 16, 2001

Risk

Agricultural producers are exposed to both price and production risk. Price risk refers to output prices, which are known post-production. Price risk results from variations in supply and demand of a commodity. Government policies may reduce this risk by the use of intervention, subsidies and quotas. Where uncertainty arises over change in policy risk will be increased. Trade liberalisation at international or even inter-regional level will increase price risk if protection is diminished. This is due to increased competition and the introduction of new commodities to an unfamiliar market (Anderson 1997). For commodities, which are imported and exported, there will be price risk arising from exchange rate fluctuation. Such fluctuation of commodity price leads to the fluctuation in farm income (Mishra and Goodwin 1997). However, some authors as Stiglitz argue that income is much more stable than prices since generally low yields of crops (and therefore bad harvest) bring about high prices and high yields of crops (and thus good harvest) bring about low prices. Income variation or uncertainty will stimulate off-farm work participation.

Production risk occurs due to elements such as weather and disease. Such risks can be limited by investment in drainage or irrigation. Disease can be reduced through the use of inputs such as herbicide, pesticide, vaccinations, etc. Crop insurance aids the reduction of production risk. Blank and MacDonald (1996) suggested that crop insurance and diversification are related. They observed that there was a greater appearance of diversification where there was no crop insurance and that farmers with lower off-farm incomes were more likely to insure.

Social-economics factors

Farm characteristics

Obviously, the characteristics of the farm itself will carry an important bearing both on the feasibility and the nature of diversified activity.

Farm size

Farm size has been shown to have a negative effect on farm household participation in the off-farm labour market and farm size also affects the type of diversification. A survey conducted in the European Communities (Gasson 1988) showed that farms in the top size class were four times as likely to be involved in farm tourism than those farms in the smallest size class, and twice as likely to have enterprises which added value to farm products. Beside increasing value added to farm products engagement of redundant labour force during off-season plays a key role because increasing size of farm means higher number of full-time workers.

Type of agricultural enterprise

There appears to be a positive relationship between extensive beef or sheep production and diversification. Dairy enterprises carry a negative effect where as the reason there can be stated higher labour requirements by dairy operations and therefore have a negative effect on off-farm employment. It can be concluded that the less labour requirement at a farm the higher participation in diversification. One can expect there will appear higher participation (or higher propensity to participate) in diversification in the less favourable and mountain areas due to higher proportion of extensive agriculture in these areas.

Farm location

The success of farm enterprises will be influenced to some extent by the location of the farm. It is possible to illustrate this where an enterprise is essentially tourism-based, such as bed and breakfast, location in a popular tourist area will increase the number of potential clients. For enterprises which market at the farm gate, location will influence the market size. Some researches proved the relationship between farm location closely to towns and off-farm work. Probability of engagement in off-farm work decreases with the distance to the town which is according to the habitual appearance.

Debt to asset ratio

Farm households with higher debt to asset ratios were observed to have a higher participation rate in the off-farm labour market (Mishra and Goodwin 1997). Farm households with higher debt to asset are supposed to look for additional income source. However, Weersink et al. (1998) observed that increasing debt to asset ratio or decreasing net farm income reduced participation in off-farm labour markets for the farmer but not for the spouse.

Household characteristics

The IDARA survey includes legal entities (joint stock companies, coops, limited liability companies) registered individual farms, and non-registered individual farms (agricultural household) which participate in agricultural activities. Following characteristics outlined below are relating to the farmer himself or his family. These characteristics are also examined in legal entities concerning the members of management of particular farm enterprises.

Farmer personality and perception of diversification

It has been reported that in Britain during the 1980s, some farmers viewed participation in the off-farm labour market as an indication of poor farming skills, or eccentricity.

Age

Age has a significant effect on participation in off-farm labour markets. The lifecycle effect is quadratic. The probability increases for younger ages, and then decreases for older ages. As retirement approaches, there is less motivation to diversify unless there is an imminent successor. Older farmers will tend to have older children and younger farmers will tend to have younger children. Thus, farmer age will tend to be an indicator of the age of the children. Older farmers may have children ready to enter the farm business which may be an impetus to diversify in order to provide sufficient work and income for the increase in available labour.

Education

Level of education and knowledge increases participation rates, more so for females than males. In a study by Furtan (1985), this was explained through the types of off-

farm employment taken up. Women were more likely to have jobs for which education was important, such as teaching, nursing etc. Whereas men tended to find employment, such as driving, for which experience but not education was important. This is because higher education levels are associated with higher income.

RESULTS OBTAINED

Important part of the project was data collecting. Two questionnaires were worked up. One questionnaire was designed on individual farms and the other one on legal entities. Individual farms involved so called registered agricultural farms being registered in the Register of Economic Units and non-registered agricultural farms not being registered (agricultural households). A number of agricultural households has been estimated about 50 000 (according to the 1995 Agrocensus, they cultivated less than 3 hectares of agricultural land). These household have been producing some commodities, mainly self-supply, consequently they manage to generate some proportion of agricultural output (even if it is hardly measurable). Obviously, these households were surveyed.

The survey included 319 farms, of which 102 legal entities, 139 registered individual farms and 78 of non-registered agricultural households. All farms were chosen from the South-West region as this region had already been chosen for conducting the ACE survey (Divila 2001). We have obtained a comprehensive database owing to the link data obtained from both surveys.

a) Legal entities

The ACE survey indicated that only 29.4 percent of legal entities have income from diversified activities including only food processing, other industrial activities, sale of processed food and other services beside agricultural income. The highest share of legal entities which had non-agricultural income – 52.2 percent recorded joint stock companies followed by coops – 28.6 percent and limited liability companies – 16.2 percent with incomes from diversified activities. These figures involve diversified enterprises to be run just in 1999. The legal entities were expected to be more involved in engagement in non-agricultural sector with respect to their size and relatively high capital facilities. However, if we look at the IDARA results, it was found that 81 percent of legal entities cultivating more than 1 500 hectares have had non-agricultural enterprises compared to 54 percent of diversified farms cultivating less than 500 ha. These figures involves legal entities which started to carry on non-agricultural activities after 1990 (or after a farm was established) regardless of further continuing existing of non-agricultural enterprises. The ACE project has shown also surprising results concerning an enlargement of their acreage. About 82 percent of all farms (legal entities) wants to enlarge their acreage, with a slightly over-average interest in coops and joint stock companies and with a slight-

ly under-average interest in limited liability companies. Larger legal entities show a higher interest in the enlargement of their acreage (the average size of those which want to enlarge cultivated land is 1,425 whilst the average size of farms without an interest in the enlargement is about 840 hectares of agricultural land). The highest proportion of legal entities which want to enlarge the land are those situated in less favourable areas (mountain and potatoes-oats region) – 87.3 percent. The results stated previously indicated that legal entities in the Czech Republic are currently more willing to start cultivating more land and therefore participating in traditional crops production instead of setting up a new of non-agricultural enterprise.

The relationship between farm specialisation and diversification has not been proved in legal entities.

The IDARA survey has also indicated the relationship between profitability of farms as legal entities and participation in diversification. In the recent years, the share of profitable farms in the subset of farms with diversified activities was 73 percent whilst the share of profitable farms in the not diversified subset was 59 percent only.

The most important reasons for starting diversification are generation of additional income in farm, smoothing of farm income and unstable returns to agriculture. On the other side, utilisation of redundant labour or production factors is not considered to be a relevant factor for making-decision by managers about diversification. We can conclude that participation in diversification in legal entities more likely occurs as a result of relative decline in farm incomes or profitability rather than as a result of utilisation of redundant production factors.

b) Individual farms

Table 1 shows the proportion of individual farms with non-agricultural incomes. Farms which cultivated from 20 to 100 hectares of agricultural land have shown the less proportion of farms with non-agricultural income. It can be due to such a farm size which provides sufficient employment of household members and simultaneously such a farm size does not require to employ additional labour force. Therefore, a farmer does not need to look for off-farm work for labour force engaged during off-season.

Table 2. Sources of income for individual farms (registered and non-registered) (%)

Source	1990	1995	2000
Income from agricultural production	16	45	48
Income from employment	61	27	19
Income from diversified activities	5	6	5
Subsidies	1	2	5
Unearned income	17	20	23
Total	100	100	100

Source: IDARA Survey 2001

The income from employment (Table 2) involves either an agricultural employment or a non-agricultural employment. The incomes from diversified activities include incomes obtained from non-agricultural on-farm enterprises as well as non-agricultural off-farm enterprises. Unearned income involves pensions, unemployment payments, dividends, interests, etc.

The essential shift in sources of income from employment to own farming happened in the first half of the 1990s when farms established. After 1995, sources are more or less stable. However, we can observe a slight shift to a larger proportion of unearned income, which might be due to the fact that farmers have been getting older – and receive pensions.

The IDARA survey has also indicated that in average 30.5 percent of farms were running non-agriculture enterprises in year 2000. Approximately 43 percent and 18 percent of registered and non-registered farms, respectively, were carrying out non-agricultural enterprises in the previous year. If we take into consideration the low share of income from diversified activities in the total household incomes (5 percent) of all farms (see Table 2), we can state that individual farmers have been preferring typical agricultural activities or off farm work (employment) to starting non-agricultural working.

Table 1. Selected indicators of registered individual farms according to farm size

Indicator	Area of agricultural land (in hectares)							
	0	> 0 ≤ 2	2 ≤ 5	5 ≤ 20	20 ≤ 50	50 ≤ 100	100 ≤ 200	≥ 200
The proportion of farm in total farms considering agricultural income as the main source of farm income (%)	25.0	22.5	20.4	35.5	69.0	76.8	82.4	88.9
The share of farm in total farms providing agricultural services (%)	–	0.1	16.7	11.8	23.8	32.1	35.3	63.0
The share of farm in total farms with non-agricultural income (%)	8.3	15.0	27.8	13.6	7.1	8.7	11.8	22.2

Source: ACE Project, Divila E. (VUZE Praha)

It was examined whether farmers which perceive diversification as a way how to be successful in business or as a mean for survival make different decision on diversification. The survey has not proved yet the relationship between the perception of diversification motivation and entering into new non-agricultural activities. However, dependence of diversification on age of a farmer has been found out. Farmers which participated in diversified activities are 49 years old in average while farmers not participated in non-agricultural activities are in average about 5 years older (54.5). The difference presented is statistically significant at $\alpha = 1\%$ (t-test). We also tested the effect of a level of education on diversification. Exactly 60 percent of diversified farms were run by farmers which had graduated from secondary school or from university. On the other side the proportion of farmers who graduated from secondary school or from university which have not diversified is 41 percent only. Also these figures approved to be statistically significant.

CONCLUSION

The data were obtained only three months ago and then the analysis has started. The currently done analytical work has provided basic information about the households participation in diversification. Factors affecting entering into the diversified activities have been examined and the obtained results are compared with the results of the previous or similar researches.

A relationship between participation in diversification and education (or farmer's age) has been proved. On the other hand, a relation between participation in diversified activities of individual farms (by means of running non-agricultural enterprises) and farm size (according to land cultivated) has not been confirmed. Farm size has been shown to have a negative effect on farm household participation (of the farmer itself as well as household members) in the off-farm labour market definitely. A comparison of the particular income sources in years 1990,

1995 and 2000 has been carried out. In this period, the share of agricultural income increased as well as the share of governmental supports in total income increased slightly in the households surveyed. The proportion of average income obtained by farmers from non-agricultural activities in total household income is approximately from 5 to 6 percent which is considered to be a low level.

We can also observe that diversification in legal entities occurs more likely as a result of relative decline in farm incomes or profitability rather than as a result of utilisation of redundant production factors.

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Comparison of the flower market in the Czech Republic and in the European Union

Porovnání trhu s květinami v ČR a EU

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Abstract: Several pieces of knowledge from the solution of the research project QC 0266 are summarized in this contribution in a synthetic form: "Adjustment to the uniform EU market of the greengrocery, fruit growing and flower growing" from the output 02, which pursues in detail the development of basic indices in flower growing. The objective of the output was to obtain data for the assessment of the Czech flower growing to concur competitiveness.

Key words: flower growing, flower market, import of flowers

Abstrakt: V příspěvku jsou shrnuty v syntetické podobě některé poznatky z řešení výzkumného projektu QC 0266: „Přizpůsobení zelinářství, ovocnářství a květinářství jednotnému trhu EU“ z výstupu 02, který se podrobně věnuje vývoji základních ukazatelů v květinářství. Cílem výstupu bylo získat podklady pro hodnocení konkurenceschopnosti českého květinářství.

Klíčová slova: květinářství, trh s květinami, dovozy květin

INTRODUCTION

Ornamental gardening is a part of agriculture and the grown plants serve to conservation and systematic improvement not only inside of buildings, but also in urban areas and in the landscape. Ornamental gardening includes flower growing and ornamental nurseries. Ornamental plants growing and marketing brings a lot of advantages to the Czech agriculture. The ornamental gardening generates jobs in the countryside. Through realisation of territorial systems of ecological stability in the landscape, horticulturists not only develop favourable conditions in the Czech landscape, but they also deepen the agriculturists' activity diversification, and in this manner, they favour business for instance in agrotourism.

On the other hand, it has to be admitted that greenhouse economics is very exacting investmentally. The current prices for procurement of greenhouses (January 2001) are approximately 27 million CZK for 1 ha for growing of cut flowers on land, and 43,2 million CZK for 1 ha for growing of pot flowers on tables.

LITERARY SURVEY AND METHOD

Growing flowers has a long and successful tradition in the Czech Republic. During the inter-war period, it represented the European top, above all thanks to our gardeners' growing ability. Flower corms, tubers and seeds had been exported regularly to the whole of Europe from the Czechoslovak Republic of that time. The traditionally

good position of our flower growing was weakened by liquidation of private ownership of horticultural corporations. Flower growing, their sale and consumption were not monitored during the previous régime, they were not subject to state plan, they did not get any subsidies, and they had a relatively free price creation. The data about the state of flower growing in the Czech Republic have been obtained from the investigation of the Flower Growers and Florists Association, further from Mr. Pavlík's works, and from the Customs Statistics.

The survey about the state of ornamental horticulture in the EU and other countries is adapted to the IAHP (International Association of Horticultural Procedures) yearbooks: International Statistics Flowers and Plants, which cover the last decade development.

RESULTS AND DISCUSSION

Last years have been evaluated as unfavourable for European growers of ornamental goods, especially the year 1999 is characterised by slow growth, and the trends of development are dominated by stagnation and reduction. The prices created were low and in accordance with low prices, low incomes were directed to growers as well. The growers from European countries had to face imports from Colombia and Ecuador, and they improved their economical situation by pot flowers production.

The production of cut flowers stagnated in 1999 (in comparison with the proceeding year) especially in Denmark, the Netherlands and Sweden. Of all the European countries, it is only Poland and Norway that show growth

in the production of cut flowers. In several European countries, both area and value of cut flowers production has grown, especially in Germany, Finland and on the British Isle of Guernsey. The value of production only grew in 1999 in France, the Netherlands and Norway. The countries that are not on top of the nursery production, i.e. Belgium and the Netherlands, announced only a slight growth in 1999. The trade in other European countries stagnated expressively with the exception of Great Britain and the Czech Republic. The requested non-European countries announced a more favourable economic development in growing cut flowers than that in Europe. In Colombia, Ecuador and Korea, both growing areas enlarged and the value of production increased. In Australia, only the value of production increased, not growing areas. In other directions of growing, only Korea announced significant increase both in production level and in export.

As to the data about the number of horticultural firms, this statistics reflects the unfavourable situation in the Europe's cut flower production. It is only Denmark, Sweden and the Czech Republic that have kept the number of nursery firms at the same level. The tree production sector remained at the level of the year of 1998, when there was noted an increase of several new firms in Belgium, Great Britain and in the Czech Republic. Outside Europe, the number of firms growing cut flowers increased in Australia, Ecuador and Korea. Australia and Korea increased the number of horticultural firms aimed at pot plants.

As to profitability of horticultural firms, unfavourable economics influences in growing cut flowers appeared. Loss making is reported in Austria, Germany, Sweden and Great Britain. In the section dealing with profit from pot plants production, growing profits are only reported from

Denmark, France and the Czech Republic. Denmark, the Netherlands and the Czech Republic also profit by production of alley trees. Profitable development outside Europe was demonstrated by increase only in Korea in production of both cut flowers and the pot ones after losses in 1998.

The interest in investment in horticultural firms has stayed in several countries on the same level. Austria, Germany, France and the British Isle of Guernsey have invested less into cut flowers production. Investment was directed into pot flowers production, which is above all the case of Denmark, further the Netherlands, Germany and France, but also Norway and Switzerland. Denmark, the Netherlands and the Czech Republic invest into tree production, only the Netherlands invests into bulb production. In Colombia, further financial means were concentrated in 1999 again, with the investment intention to produce cut flowers.

The increase of work place did not take place, on the contrary, it has been decreasing continually or stagnating, especially in Austria, Great Britain, Finland and Germany. The growers of pot flowers represent an exception. New working place were created in all sections of ornamental gardening in the Netherlands; in France, this way only the case of pot flowers section. From the interviewed countries outside Europe, increase in working place have been only reported from Australia, in horticultural firms specialised in cut and pot plants.

Stocks of ornamental goods, namely flowers, shrubs and trees, have increased most in European countries in comparison with last years. Such countries as Denmark, Sweden and Switzerland did not participate in the mentioned development of the market, the stock remained unchanged there. As a whole, the development of de-

Table 1. Production values – flowers and pot flowers¹⁾ in chosen countries in thousands of EUR

Year	J	NL	USA	I	D	F	UK	DK	B
1990		2 283	2 152	1 680	917	838	348	344	243
1992		2 497	2 329	1 911	1 151	880	351	331	246
1994	3 420	2 790	2 722	2 074	1 298	876	394	328	260
1996	3 174	2 934	2 466		1317	979	396	351	225
1999		3 259			1 135	956	458	354	207

Note 1) cut flowers, cut foliage, pot flowers, bedding plants 1996: USA, D = 1995; 1999: B, DK = 1998, UK = 1998p, D = 1997
Source: AIPH/Union Fleurs: International Statistics Flowers and Plants 2000

Table 2. Growing area of flowers and pot flowers¹⁾ in chosen countries in ha

Year	USA	J	NL	I	D	UK	F	E	IL	B	GR	DK
1990	14 352		7 243	8 555		6 704	3 795	4 911	1 520	1 572	882	667
1992	16 042		7 625		7 380	6 658		4 343	1 908	1 668	910	
1994	15 418	8 270	7 951	7 654		6 855		4 325	1 900	1 791	876	683
1996		8 560	8 004		7 066	6 459			1 910	1 657	990	628
1999			8 526			7 230	6 628		2 245	1 684		

Note: 1) cut flowers, cut foliage, pot flowers, bedding plants, under glass and in the open area 1999: B = 1998, UK = 1998p
Source: AIPH/Union Fleurs: International Statistics Flowers and Plants 2000

Table 3. Production values and number of holdings in flower growing

	State	Production million EUR	Holdings No.	Year
Europe	Austria	240	1 357	99
	Belgium	207	2 689	98
	Czech Republic	22	1 150	99
	Denmark	354	1 054	96/Val.98
	Finland	76	998	99
	France	956	7663	98
	Germany	1 174	10 800	96
	Guernsey (isle UK)	53	239	99
	Hungary	95	3 000	99
	Ireland	6		80
	Italy	1 826		94
	Netherlands	3 259	9 457	99
	Norway	103	690	99
	Poland	186 ^e		95
	Spain	345		94/Val.90
	Sweden	199		96/Val.90
	Switzerland	450		90/Val.85
United Kingdom	471 ¹⁾	9 400	98p	
Total	9 970	48 258		
Middle East	Izrael	226		98
	Turkey	15		93
	Total	241		
Africa	Kenya	45		95
	Morocco	11		95
	South Africa	69		95
	Uganda	8		95
	Zimbabwe	27		95
	Total	160		
Asia, Pacific	Australia	335	3 046	96/97
	China	34 336		94
	Hong Kong	7		95
	Japan	3 174		96
	Korea	568	10 838	99
	Malaysia	15		95
	Singapore	10		95
	Sri Lanka	5		95
	Thajwan	93		95
	Thailand	61		95
Total	38 604	13 884		
North America	Canada	522	4 340	96
	United States	2 502		95
Total	3 023	4 340		
Central and South America	Brazil	115		95
Colombia	542	450	99	
Ecuador	15		95	
Guatemala	17		95	
Total	690	450		
World		49 666	62 831	

Source: AIPH/Union Fleurs: International Statistics Flowers and Plants 2000

Note: e) estimation; 1) including flowers from bulbs

mand weakened in comparison with last years. Customers looked more intensively only for some products and only some countries. For instance in Belgium, people were interested in cut flowers, shrubs and trees, in France in cut flowers, pot plants and bulbs, in Germany and in the Netherlands in pot plants, shrubs and trees, in Poland in pot plants, especially in roses. There is an unambiguous result from the extremely growing stock, the impossibility to raise prices, which has led to low economic effects. Risky cut flowers import has been referred to as the cause of price all in Germany, France, Austria and Poland. In Great Britain, a powerful position of supermarkets affects the market. Higher prices have been only reported in a few countries. These have been France except for cut flowers, Belgium and the Czech Republic with the exception of bulbs.

The following Tables 1 and 2 documents the value of production in the chosen countries, advanced in flower growing, in thousands of EUR. The increase in production in the time line from 1990 to 1999 has been documented in all the countries except Belgium. The acreage of growing areas are given in Table 2, and in well-developed countries, there can be seen the increase of areas in ha. In Table 3 a more detailed comparison is given. In Table 4, basic comparison in ornamental nursery is given.

Technical base for growing flowers

The structure of areas of land in hectares from 1973 to 2000 is given in Table 5. In the first place, the greenhouse

Table 4. Ornamental tree nursery

State	Area of land	Production million EUR	Holdings No.	Year
Austria	***	***	297	99
Belgium	4 450	207	1 040	98
Czech Republic	627	9	165	99
Denmark	3 397	69	549	96
Finland		19		99
France	17 031	399	4 690	98
Germany	27 011	848	4 500	96/Val.89/99
Hungary	1 800	40	***	99
Italy	11 807			90
Netherlands	11 713	519	7 035	99
Norway	200	34	150	99
Poland	1 452			85
Sweden	761			90
Switzerland	1 350			90
United Kingdom	8273	416	***	98p
Total	89 872	2 559	18 426	
Canada	21 251	195	4 844	96
Japan	14 715			94
Turkey	98			93

Source: AIPH/Union Fleurs: International Statistics Flowers and Plants 2000

Note: *** see flowers and pot plants; p – provisional data

Table 5. Acreage of production areas in the Czech Republic in ha

	1973	1978	1983	1988	1993	1995	2000 ²⁾
Glasshouses	105,2	134,1	158,3	185,0	125,0	125,0	115,0
Foil covers	48 ¹⁾	8,4	15,7	22,0	5,0	5,0	5,0
Hotbeds	44,1	39,7	28,7	11,0	5,0	7,0	9,0
Total covered area	154,1	182,2	202,7	218,0	135,0	135,0	129,0
Area in the open	300,0	359,0	254,0	200,0	105,0	100,0	85,0

Note: 1) heated; 2) assessment Association of Flower Growers and Florists (SKF)

Source: Pavlík J.: Statistical inquiry, 1985; Nachlinger Z.: Czech flower growing. European integration 16/1999

economy is to be located into optimal natural conditions, regarding the assortment grown, from the point of view warmth, light and water, in consideration of the intended hydroponics.

Proximity of outlet, minimalization of transport kilometres and the possibility to establish a parking, as well as taking into account all the other conditions to locate the greenhouse business lead to the firm's prosperity. At present, the growers are conscious of the fact that greenhouses guaranteeing a high productivity of work by their technological equipment are as important as optimal nourishment or properly formulated breeder's intentions.

The unity production value varies very much in the given types of growing equipment. Horticultural firms are supposed also to apply technological junctures in using various types of equipment, so that it is difficult to separate the percentage of yields of individual species with various equipment. The Association of Flower Grower and Florists (SKF) estimates the mean production from the unit area in Table 6. The technical state of individual pieces accords with their age. Our greenhouses have unfavourable energetic parameters, which are bad from two points of view:

- higher energetic consumption charges the economy by increased costs;
- the need for larger amounts of energetic charges the environment with emission more than it is necessary.

The situation on the flower market

Flowers are goods that are non-essential for consumers - their absence does not jeopardize the lives of the consumers' public. Another big and perspective group is so called balcony plants and bed plants. The last major group

Table 6. Mean production from the unit area

Area	CZK/m ²	Technical service life years	Real age years
Glasshouses	830	25	30
Foil covers	350	15	15
Hotbeds	250	10	10
Area in the open	140	-	-

Source: Nachlinger, Z.: Czech flower growing. European integration 16/1999

are pot flowers with ornamental foliage, which are used as permanent decoration of rooms inside buildings. Their percentage in the market has been decreasing little by little, which resembles the situation in the Western Europe. Another group is represented by dried plants and those that are modified in another way. They come into fashion and arrangements made from them have been demanded more and more. A separate group without great fluctuations in turnover is represented by floristry products from both live and dried material (bunches of flowers, bouquets, mourning wreaths, All Souls wreaths, Christmas candle-sticks etc.) The value of flowers and flower services in the basket of consumption in the Czech Republic was about 4.6 milliard CZK in 1998 and 5.4 milliard CZK in 1999, which represented on the average 477 CZK and 551 CZK on one inhabitant, respectively.

The percentage of the mentioned groups in the market (estimation) from this the own production of the Czech Republic:

Cut flowers and the green	45%	20%
Flowering pot flowers	13%	11%
Pot plants with ornamental foliage	10%	65%
Bed plants and balcony plants	15%	95%
Bunched products	12%	100%
Dried flowers and products	5%	30%

The percentage of the own production and that of import in the Czech Republic market, the export of our grown products, the percentage of distribution and that of retail trade in the formation of the above - mentioned market value of the floristic goods is also involved in Table 7, Flower Market Balance.

Influences of the foreign environment

Regarding to the intense reduction of inland production, which has intensified since the beginning of the nineties, and thanks to the increasing demand for flowers, import has been playing an important part on our market at present. It is possible to evaluate, to which extent its meaning is important by the balance of foreign trade with flowers in Table 8, where there is apparent a negative trade balance. The export volume is so insignificant that inter - yearly increases of import are hidden behind inter - yearly increase of foreign balance. Further-

Table 7. Balance of flower market in the Czech Republic (million CZK)

	1994	1995	1996	1997	1998	1999
Sources:						
Inland production	650	650	640	660	740	840
Import*	512	606	725	917	980	1127
Illegal import**	72	88	104	236	199	234
Cost of import	72	87	106	147	155	160
Total sources of goods	1 306	1 431	1 575	1 960	2 074	2 361
Sale:						
Export*	48	46	45	73	88	61
Inland sale	1 258	1 385	1 530	1 887	1 986	2 300
Total sale	1 306	1 431	1 575	1 960	2 074	2 361
Distribution cost	126	139	77	189	298	460
Retail sale margin	931	1 020	1 073	1 397	1 542	1 698
Tax on the value added	520	570	599	780	861	994
Consumption:*	2 882	3 159	3 324	4 325	4 775	5 513
Inter-yearly increase % *	10	5	30	10	15	
Mean consumption CZK/l inhabitant of the Czech Republic	288	316	332	433	477	551

* the customs item 0604 (cut sprouts, foliage without bloom); ** the difference between the statistics of CZ a NL is given
Source: Nachlinger Z., Association of Flower Growers and Florists (SKF)

more, the increase of import shows to be quite stable, namely in the mean for the pursued period by 18.4 per cent a year. Regarding to the percentage of import (more than 50%) in the inland sale of flowers, the importance of import is unignorable. Nevertheless, the real percentage of import is even much bigger; after counting in the illegal import, it reaches up to 70%.

Flowers pursuant to the origin of import

The majority of ornamental plants which participate in import to the Czech Republic come from the Netherlands,

Table 8. Development of the balance of flower foreign trade, million CZK

	1994	1995	1996	1997	1998	1999
Import	511	606	724	917	984	1 207
Export	48	46	45	73	88	61
Foreign trade balance	-463	-560	-679	-844	-896	-1 146

Source: Customs statistics

as it is given in Table 10. The Netherlands belong to the world's top in flower growing, especially in the cut flower market, it is the biggest exporter. The causes of an important influence of the Dutch gardeners on world markets include the favourable geographical situation, an important tradition in growing flowers, liberalization in trade relations and a good organization of markets in the form of flower exchanges. The first flower exchanges were founded 75 years ago. It is not only flowers from the European countries that go through these flower exchanges, but also flowers from Africa, South America

and Asia have been imported here. The Dutch also maintain their position in the market by enforcing targeted marketing.

The flower sale support has been safeguarded both inland and in foreign countries by the Bloemenbureau Holland Company. Nevertheless, differences among individual groups of imported goods arise. In cut flowers and bulbs, there are no conspicuous changes of marketing percentage, stated from the import of flowers into the Czech Republic. However, there are some changes in other kinds of import. The decrease of Dutch import is remarkable especially in the cut green, and in a less important extent in indoor flowers. The lowering of market percentage in cut green plants is accompanied by the entrance of new competitors into market (the U.S.A., Costarica, Israel and India in 1996, Italy one year later). The decrease of marketing percentage in indoor and outdoor plants is provoked by similar factors.

That means the more significant entrance into market of Denmark (5%) and Slovakia (1%) and an increased pressure of Germany. In spite of all the changes, the Dutch have still a more than strong position in our flower market, their present percentage in flower import into the Czech Republic represents 71.7%.

Possibilities of flower export

The IAHF statistics give two items regularly in the seventies and eighties, where the Czechoslovak grown products had a small, but steady percentage in the European market – onion (*Allium cepa*) and pot flowers. After the greenhouse areas had been enlarged in our country by approximately 200% in the years 1968–80, the capacity of production equipment increased to such an extent that it covered the extremely quickly increasing demand of

Table 9. Percentage of individual groups of goods in the total import into the Czech Republic, %

	1994	1995	1996	1997	1998	1999
Bulbs	6,24	6,26	4,41	4,90	5,59	5,40
Indoor and outdoor plants	12,99	12,95	13,77	15,05	18,37	19,08
Cut flowers, fresh and dried	79,70	79,35	80,20	69,33	64,41	63,44
Cut foliage				9,23	9,50	10,44
Flower seeds	1,07	1,44	1,62	1,50	2,13	1,64

Source: Customs statistics

Table 10. Importers of flowers into the Czech Republic in the year 1999

State	Import million CZK	Import percentage of individual countries %
1. Netherlands	865,7	71,71
2. Israel	49,6	4,11
3. Colombia	48,7	4,03
4. Germany	34,8	2,88
5. Thailand	31,0	2,57
6. Italy	27,8	2,30
7. Costarika	26,6	2,20
8. Slovakia	25,5	2,11
9. United States	22,4	1,86
10. Denmark	13,0	1,08
11. others	62,1	5,14

Source: Customs statistics

that time and there was still enough goods left to offer abroad. Gradually, pot flowers became an item of firm intentions to obtain foreign exchange, and the amounts of export increased more and more. The consumers of our pot plants were in many European countries (West Germany, Austria, Hungary, all countries of the then Yugoslavia, Italy, Switzerland, the Netherlands, Denmark, Sweden, Finland, Poland). The volume of the offer for export had been decreasing from 1991, when transformation preparations started, till 1996. The main reason was reduction of the inland production after break down of production capacities. This resulted in breaking of trade contacts with customers and these markets were occupied by firms from Holland and Denmark. The effort to restore these contacts was not successful because of the permanent overproduction of flowers in Europe. We hold the situation with Slovakia thanks to the increasing exchange of goods; this country is our greatest partner as to export (but also including reexport), and as to import, it goes up step by step in the list of suppliers every year.

CONCLUSIONS

For the Czech flower growing to become more competitive, it is necessary, as soon as possible to contribute to:

1. Suppressing illegal import into the Czech Republic, mostly from the Netherlands. It is thought to be of great importance to join customs offices and financial offices with the aim of targeted checks of those businessmen who aim at unfair competition in the flower market.
2. Modernizing the greenhouse production, i.e. to carry out the reconstruction of greenhouses in such a manner that flower production can be safeguarded in the optimal climate, it means while minimizing expenses for the optimal light, warmth and moisture conditions. The greenhouse economy reconstruction concerns not only flower growing, but also greenhouses for vegetable growing. It is necessary to seek possibilities for financing greenhouses reconstruction not only from the means of the Ministry of Agriculture, but also from other departments, where horticulture is involved thanks to its multidisciplinary nature. It is necessary to ensure first – quality technological, technical and economic consulting service for businessmen in horticulture. It is above all the Association of Flower Growers and Florists (SKF) that plays an unsubstitutable role here.
3. Initiation of a marketing society for ornamental goods. It is necessary to make use of the Czech marketing societies dealing with fruit and vegetables.
4. Carrying through the horticultural politics and enhancing the acquaintance with Czech flower growers and production of nurseries out side this department.

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Z VĚDECKÉHO ŽIVOTA

K osmdesátým narozeninám prof. Ing. Karla Svobody, CSc.

Dne 26. října 2001 oslavil v dobrém zdraví a plně duševní svěžesti osmdesát let svého čínorodého života známý zemědělský ekonom prof. Ing. Karel Svoboda, CSc.

Česká, slovenská, československá i širší zahraniční zemědělská a ekonomická veřejnost vede v patrnosti výraznou a dlouhodobou úlohu prof. Ing. Karla Svobody, CSc. při jeho úspěšném působení v zemědělském ekonomickém výzkumu a v zemědělském vysokém školství. Je nutno poznamenat, že v rámci svých profesních kontaktů byl a je dosud ve spojení se všemi významnými univerzitami a výzkumnými pracovišti ČR, SR a „blízkého okolí“, zejména v německé jazykové zóně.

Bez nadsázky lze uvést, že jubilatovy bohaté zkušenosti, invence, pracovitost a schopnost rychle odhalit jádro problému, jsou významným přínosem pro rozvoj Provozní ekonomické fakulty ČZU v Praze, která jeho služby stále využívá.

Životní dráha jubilanta začíná krátce po vzniku Československa a je třeba poznamenat, že prof. Svoboda nebyl v žádném případě pasivním účastníkem běhu doby, nopak vždy byl čínorodým aktérem, což mu často přinášelo nemalé potíže. Zapojení do odbojové činnosti, následné zatčení a věznění v období okupace státu zásadně ovlivnilo životní postoje i celý jubilatův život. Po návratu z koncentračního tábora Manthauzen koncem války se téměř okamžitě zapojil do složitého procesu poválečné obnovy československého hospodářství a společnosti.

Zaměření pracovní a odborné činnosti profesora Svobody bylo od počátku orientováno na oblast zemědělství. Významná část jeho profesní činnosti byla spjata s Výzkumným ústavem ekonomiky zemědělství v Praze, kde působil ve funkci zástupce ředitele pro vědeckou práci a vedoucího oddělení. Paralelně s vysokým pracovním zatížením ve VÚZE absolvoval s vyznamenáním Vysokou školu ekonomickou v Praze, získal vědeckou hodnost kandidáta ekonomických věd na základě obhajoby jedné z prvních disertačních prací na úseku zemědělské ekonomiky, byl jmenován docentem, vedoucím vědeckým pracovníkem a v roce 1969 profesorem zemědělské ekonomiky. V období 1968–1970 byl ve funkci odborného poradce prezidenta republiky. Poté přechází na Vysokou školu zemědělskou v Praze na Katedru zemědělské ekonomiky jako profesor a vedoucí Výpočetního ústavu. Jeho dlouholetá a úspěšná pedagogická práce byla založena na rozsáhlé vlastní vědecké a výzkumné činnosti a návazné vysoké publikační aktivitě. Nejdelší období jeho profesní aktivity je spjata právě s jeho působením na Vysoké škole zemědělské v Praze, později České zemědělské univerzitě v Praze.

Je třeba uvést, že rozsah vědecko-výzkumné a odborné činnosti dokázal prof. Svoboda srozumitelnou formou sdělit vědecké a odborné veřejnosti prostřednictvím desítek knižních publikací a stovek časopiseckých sdělení v ČR i zahraničí. Považuji za účelné připomenout zásluhy při publikování prací v oblasti uplatňování matematických metod, výpočetní techniky a produkčních funkcí v zemědělství, které patřily mezi první ve svém oboru.

Profesor Svoboda celou řadu let reprezentoval Československo jako národní delegát ve společné pracovní skupině FAO/ECE/AGRI v Ženevě, přičemž v rámci několika zasedání tohoto významného mezinárodního fóra k ekonomickým otázkám evropského zemědělství byl zvolen předsedou resp. místopředsedou.

Při výčtu aktivit profesora Svobody nelze vynechat jeho účast a působení v rámci četných vědeckých seminářů, konferencí a podobných setkání v ČR i zahraničí. Jeho originalita, orientace v komplikovaných problémech hraničních vědních oborů souvisejících se zemědělskou ekonomikou, dar vymezit klíčové souvislosti, schopnost vyhmátnout „jediné“ chyby v textech doprovázená osobitým a nekonformním přístupem k pracovní i společenské části těchto setkání se stala příslovečnou. Kromě toho je třeba zdůraznit velký podíl jubilanta na přípravě celých zástupů vědeckých pracovníků z ČR, Slovenska, Švýcarska, SRN apod., které vedl, konzultoval či jejich výzkumné, kandidátské, doktorské či habilitační aj. práce opouval.

Jubilantova úspěšná vědeckovýzkumná a pedagogická činnost, příprava vědeckých pracovníků a další společenské aktivity byly opakovaně a na vysoké úrovni oceněny celou řadou výzkumných, akademických a společenských institucí jako uznání jeho přínosu profesního i občanského.

V případě životních výročí prof. Svobody jsem zaznamenal opakované dotazy, které směřovaly k receptu jubilanta na životní elán, pracovní výkonnost, duševní svěžest a humor. Kolegům, přátelům a známým na oslavě osmdesátých narozenin se dostalo cti seznámit se se složením tohoto unikátního receptu z dílny profesora Svobody, jeho slovy:

„Vezmi prvních pět roků dětského blaha, přidej k tomu deset roků hladu a bídy, doplň to třemi roky chuti, ohromné chuti porvat se o místo na Slunci, které Ti dosud chybělo, opepři to dalšími pěti lety kriminálu a koncentráku a vyjde Ti velmi tvrdé těsto. Z něho pak po všechen dalších roky odlamuj po kouscích. Každý z těchto kousků peč v peci své vlastní dřiny a nikdy neutuchající snahy porvat se znovu o místo na Slunci, které Ti bylo

odňato. To dělej každý rok znovu a znovu. I když Ti těs-
to bude ubývat, přesto vždycky nějaký jeho drobek
musíš najít. A při trvalém pečení nikdy nezapomínej mít
stále rád lidi a věřit, že vždy máš šanci poznat dobrého
člověka, který Ti umí podat pomocnou ruku, když jsi
v nouzi. K tomuto všemu patří nejen plný kopec srandy
a vtipů, ale také ochota pomoci jinému a věnovat mu svůj
úsměv v době, kdy jej nejvíce potřebuje.“

Úplný přehled a charakteristika celoživotní aktivity
profesora Svobody nelze na tomto místě uvést a to ze-
jména z toho důvodu, že zmíněný recept je velmi účinný
a participace jubilanta na úkolech katedry a fakulty je
i nadále přínosná.

A proto spolu se spolupracovníky, přáteli a celou aka-
demickou a vědeckou komunitou přeji profesoru Svo-
bodovi pevné zdraví a optimismus.

Doc. Ing. Miroslav Svatoš, CSc., Provozně ekonomická fakulta ČZU v Praze, Česká republika

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INSTRUCTIONS FOR AUTHORS

Original scientific papers, short communications, and selective reviews (i.e. papers based on the study of agricultural literature and reviewing recent knowledge in the given field) are published in this journal. Articles are published in English, reviews and information also in English, Czech and Slovak. Each manuscript must contain an English and a Czech summary (including key words). Czech abstracts will be provided for foreign authors. The author is fully responsible for the originality of his paper, for its subject and format. The author should make a written declaration that his paper has not been published in any other information source. The board of editors of this journal will decide on paper publication, with respect to expert opinions, scientific importance, contribution and quality of the paper. The paper should not exceed 15 typescript pages, including tables, figures and graphs.

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If any abbreviation is used in the paper, it is necessary to mention its full form for the first time it is used, abbreviations should not be used in the title or in the summary of the paper.

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Abstract should contain the subject and conclusions of the paper, not a mere description of the paper. It must present all substantial information contained in the paper. It should not exceed 170 words. It should be written in full sentences and contain basic numerical data including statistical data. It must contain keywords. It should be submitted in English and, if possible, also in Czech.

Introduction has to present the main reasons why the study was conducted, and the circumstances of the studied problems should be described briefly.

Review of literature should be a short section, containing only references closely related to the main topic of the paper.

Only original **methods** should be described, in other cases cite the method used and any modifications. This section should also contain a description of experimental material.

In the **Results** section figures and graphs should be used rather than tables for presentation of quantitative values. A statistical analysis of recorded values should be summarized in tables. This section should not contain either theoretical conclusions or deductions, but only experimental data.

Discussion contains an evaluation of the study, potential shortcomings are discussed, and the results of the study are compared with previously published results (only those authors whose studies are closely related to the published paper should be cited). The section Results and Discussion may be presented as one section.

The **References** section contains citations arranged alphabetically according to the surname of the first author. References in the text include the author's name and year of publication. Only the papers cited in the text of the study should be included in the list of references.

The author should give his full name (and the names of other collaborators), academic, scientific and pedagogic titles, full address of his workplace and postal code, telephone and fax number or e-mail.

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