Consequences of applying the Conception of the Agricultural and Food Policy to the year 2005 and effects of the optimized allocation of production in the Slovak Republic

Důsledky uplatnění Koncepce agrární a potravinové politiky do roku 2005 a efekty optimalizovaného rozmístění produkce ve Slovenské republice

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Abstract: In the paper, there is described using of the optimization models AGRO-3 SR for modeling food production chains in the Slovak Republic (the modified version of the Czech model AGRO-3) and ALOKA for optimal allocation of the domestic agricultural production computed by AGRO-3 SR into 4 different regions of the SR for simulation of consequences of various types of agrarian policies on the effectiveness of the Slovak agriculture to the medium-term horizon 2005. There are formulated and evaluated 4 scenarios for the model AGRO-3 SR and two alternatives A and B for the model ALOKA relating to all scenarios. Results of simulations have shown that the best result was reached in the scenario 4 by the price liberalization in the whole food chains.

Key words: agrarian policy, predictions, mathematical models, partial market equilibrium, optimization, regional allocation

Abstrakt: V příspěvku je popisováno využití modelu AGRO-3 SR pro modelování potravinových řetězců ve Slovenské republice (modifikovaná verze českého modelu AGRO-3) a modelu ALOKA pro optimální rozmístění domácí zemědělské produkce vypočtené modelem AGRO-3 SR do 4 regionů SR pro simulaci dopadů různých typů agrární politiky na efektivnost slovenského zemědělství ve střednědobém horizontu do roku 2005. Jsou formulovány a vyhodnoceny 4 scénáře pro model AGRO-3 SR a dvě alternativy A a B pro model ALOKA vztahující se ke všem scénářům. Výsledky simulací ukázaly, že nejlepší výsledek byl dosažen ve scénáři 4 při liberalizaci cen v celém potravinovém řetězci.

Klíčová slova: agrární politika, predikce, matematické modely, dílčí tržní rovnováha, optimalizace, regionální rozmístění

APPROACH TO PROBLEM SOLVING

The Research Institute of Agriculture and Food Economics in Bratislava has elaborated a study on perspectives of the Slovak agriculture with respect to the Conception of the Agricultural and Food Policy to the year 2005 (further only Conception) considering regional aspects of the Slovak Republic (Božík 2001).

The aim of the study was the evaluation of using the economic tools and economic and production goals defined in the Conception for the period 200–2005 where the year 2005 is assumed as the accession year of the Slovak Republic to the EU. For this purpose, two optimization models were used – the model AGRO-3 SR for the modeling of food chains of the SR and the model ALOKA for optimal allocating of the domestic production generated by the model AGRO-3 SR into 4 regions of the SR.

The use of the model AGRO-3 SR, which is the modified version of the model AGRO-3 for the Czech agrarian sector (Foltýn, Zedníčková 1998, 2001), is a result of the cooperation between the Research Institute of Agricultural Economics, Prague and the Research Institute of Agriculture and Food Economics, Bratislava represented by the authors of this article.

Characterization of the models AGRO-3 SR and ALOKA

The model AGRO-3 SR is a partial equilibrium model of the agrarian sector of the Slovak Republic. This model is based on the supply and demand equilibrium for three markets – the market of agricultural commodities (market 1), the market of processed commodities (market 2) and the market of final food products (market 3).

Exogenous variables of this model are general macroeconomic conditions (world prices, inflation, exchange rate, household income etc.), special economic conditions of the Slovak agrarian sector (costs of agricultural commodities, functional relations between incomes and costs in the markets 1–3, initial food consumption in the basic year 1996, income and food demand elasticities etc.) and conditions of the agrarian policy and interna-

tional commitments of the Slovak Republic (production quotas, tariffs etc.). Endogenous variables are production volumes, domestic prices, processor's and retailer's costs, target food demand and exports and imports in all markets. The model AGRO-3 SR is a non-linear optimization model with the objective function - profit of producers, processors and retailers.

The model ALOKA is aimed at the optimal allocating of the results of the Slovak agriculture as a whole obtained by the model AGRO-3 SR without respect to regional aspects. The model allocates the computed domestic agricultural production into 4 regions of the SR on the base of the profit maximization for all regions. The definition of regions is as follows: To each administrative unit (district), there is assigned the average administrative land price[1] and on the base of this value the considered district is placed to one of the 4 regions ordered according to the average land price groups (denoted by SCP):

– region 1: SCP 56–90 ths. SKK/ha of agricultural land, no subsidies to LFA;
– region 2: SCP 39–48 ths. SKK/ha of agricultural land, subsidies to LFA;
– region 3: SCP 23–35 ths. SKK/ha of agricultural land, subsidies to LFA;
– region 4: SCP 8–21 ths. SKK/ha of agricultural land, subsidies to LFA.

Problem solving by the model AGRO-3 SR

For an evaluation of the influence of support tools and production goals, there were created two macroeconomic scenarios and their variants. The year 1999 was chosen as the basic period. The domestic reference prices in the basic period were defined by the average import value of the given group of products in the year 1999 and 2000 (for the year 1999, and 2000, respectively) and it generated the position of the domestic producer prices. For their level, it was deciding:

1. Determining of the minimum and maximum range of profitability (profit) of the agriculture, food industry and retail in commodity structure.
2. Defining of the population demand determined by
   – the maximum level of the food prices increase
   – the minimum and maximum increase of the expenditures on non-food products
   – the minimal income index.

Scenario 1: The basic scenario, which reflects actual behavior of the food chains, will continue (with the high probability) till the end of the prediction period 2005. Its main characteristic is the hard pressure of the retail chains on the food industry, which is transferred into the agriculture. For the period 2000–2005, there are assumed the following assumptions:

1. No administrative determining of the basic raw material prices.
2. No change in the effectiveness level of the food industry determined by the technological investments and the mass inflow of the foreign capital. (For this reason, it is assumed that the profit creation in the food industry at the expense of the agriculture will continue even in the future.)
3. The import pressure will continue.
4. The intensity of agriculture will increase to the level given by the Conception.
5. The macroeconomic assumptions used in the solution were taken from the medium-term prediction of the Institute for the Informatics of the Slovak Statistical Office (Infostat).

Scenario 2: The only difference from the scenario 1 is the point 5: Macroeconomic assumptions were taken from the medium-term prediction of the Institute for the Slovak and World Economy of the Slovak Academy of Sciences.

With relation to the fact that the prediction of the Slovak Academy of Sciences is more pessimistic than the prediction of the Slovak Statistical Office what would cause the decrease of the passive trade balance and on the other hand, the increase of food expenditure and food prices.

Scenario 3: The main difference from the previous scenarios is the definition of goals:

a) to reach the well-balanced agrarian trade;
b) to reach 10% profitability of agriculture.

This profitability should enable to invest at the inevitable level necessary for the simple reproduction process in the agriculture. To reach a well-balanced agrarian trade means to enable self-sufficiency in the domestic food production with the exception of the food products of the non-domestic origin (e.g. coffee, tea, tropical fruits etc.).

This scenario has the following assumptions:

1. Export prices either must not exceed the world prices (in case of exports without subsidies), or exports do not exceed the WTO commitments (in case of exports with subsidies).
2. Import prices (including world prices and tariffs) do not exceed domestic prices.
3. The 10% profitability can be reached by increasing subsidies for production and Less Favorable Areas (LFA) up to the 1.5 times higher level of the Conception (3.2 bill. SKK for LFA, 3.8 bill. SKK for market regulation and 0.8 bill. SKK for improving the agricultural trade conditions).
4. Macroeconomic conditions are the same as in scenario 1.

Scenario 4: The population income, growth of the fixed necessary expenditures (rent, transport, energy etc.) and macroeconomic environment has the deciding influence

[1] Administrative land price is set for the tax and support policy purposes.

on the economic results of agriculture, food industry and food demand.

The aim was to provide such growth of domestic prices, which would cause, with the actual subsidy level, at least 10% growth of the profitability of agriculture. The special assumption of this scenario: The household income index is a variable with the feasible values in the interval from 1.517 (predicted value of the scenario 1) to 2.0 during the model computation.

Problem solving by the model ALOKA

The production generated by the above-mentioned scenarios 1–4 and computed by the model AGRO-3 SR was optimized by the model ALOKA from the regional point of view and allocated into 4 regions of the SR defined in the section 1.1 on the base of the maximum profit in each region. This approach led to 4 scenarios for 4 regions. In addition there were formulated two alternatives for each scenario differing by the way of applying production subsidies in regions.

Alternative A: If the result of the model computation was a loss in the given region (on the base of optimization), then this loss has been compensated by the appropriate subsidies.

Alternative B: The commodity support can move in boundaries given by the level of the Conception, or by the level generated by the model AGRO-3 SR, whereas the possible losses are not compensated.

In the allocation step, it is assumed that the allocated optimized size of production is a socially accepted one in each region. So that not to prefer the economic point of view only, there were defined the minimum and maximum feasible bounds of acreage for the chosen plant commodities and the feasible land burden by the livestock commodities (cattle, suckler cows and sheep).

RESULTS

Scenario 1

The model result in this scenario was a loss at the level 5.6 bill. SKK, which was partly compensated by the subsidies (7.4 bill. SKK). Then the total income of agriculture is 1.8 bill. SKK. This result is the important improvement compared to the actual state, but it does not enable sources creation for the production revitalization of this branch. From the whole available production land (2 443 ths. ha) 1 910 ths. ha were utilized. In this scenario with compared to other scenarios. The following results was reached: the lowest sales (63.3 bill. SKK), the low agricultural export (0.9 bill. SKK), the high import of the food commodities (7.4 bill. SKK) and the high passive balance of the agrifood trade (–3.4 bill. SKK). These results indicate that the negative trade balance will not be probably improved either in the future in the spite of the limited demand. The agrifood subsidized exports reached 1.4 bill. SKK and the level of the export subsidies is deeply under the WTO commitments.

The simulated economic consequences of the Conception with relation to the originally modeled size of production to the horizon 2005 presented 12.3 bill. SKK of the subsidies (from which 5.6 bill. SKK for the production support and 6.7 bill. SKK for the LFA support). Let us note that in the final proposal, there were accepted only 7 bill. SKK (3.8 and 3.2 bill. SKK, respectively).

The model results of this scenario represent the support drawing of 7.4 bill. SKK from which 3.1 bill. SKK for LFA (1 617 SKK/ha) and 4.3 bill. SKK for the production support.

The consumer effect of this scenario up to the year 2005 with respect to the year 1999 is manifested by the food prices increase (1.33) under the inflation level (1.465) and under the household income growth index (1.517), which caused the decrease of the food expenditure share.

Applying the regional approach by the model ALOKA has led to the more positive economic results of the whole agriculture. The original non-optimized production volume from the regional point of view represented loss of 5.2 bill. SKK. By the ALOKA optimization, there were obtained the following total results:

– in the alternative A: profit 5.2 bill. SKK (2 945 SKK/ha), subsidies 3.6 bill. SKK (2.3 for production, 1.3 for LFA), income with subsidies 8.8 bill. SKK, agricultural land use 1 758 ths. ha (decrease against the non-optimized land use by 461 ths. ha);
– in the alternative B: profit 5.3 bill. SKK (2 732 SKK/ha), subsidies 6.5 bill. SKK (4.8 for production, 1.7 for LFA), income with subsidies 11.9 bill. SKK, agricultural land use 1 943 ths. ha (decrease against the non-optimized land use by 276 ths. ha).

The results obtained by the model ALOKA show that the production supports compensate sufficiently the production losses if the production is optimally allocated according to the commodities.

The results of the individual commodity groups show the following

– cereals: in the alternative A,there would appear the decrease of land use for cereals in the regions 3 and 4 by 261 ths. ha and in the alternative B by 240 ths. ha, on the other hand the increase of land use in the productive regions 1 and 2 by 97 ths. ha and by the 78 ths. ha (against the base year 1999). In accordance with the Conception, there would increase the average ha yield by 11.5% to the level 5.7 t/ha;
– oil-seeds: with respect to the growing effectiveness even in the LFA the transfers would not be too important;
– potatoes: the part of production would be transferred to the regions without subsidies (region 1) or to the regions with the low level of subsidies for land.

One of the goals of the agrarian policy is the support for higher utilization of the permanent grassland and the cattle and sheep breeding as before. With respect to the lack of the exact information on economic results of the suckler cows (SC) in relation with a grassland utilization

there where used costs of the fattening cattle. The number of heads of SC (as an environmental goal) was limited on the low bounds. As a result there were obtained the following findings:

– The relatively big increase of SC on the level 56 ths. heads. This increase was allocated in the decisive measure into the region 3, whilst in the region 1 no SC were allocated (the desired production was reached without SC).
– The increase of SC in a region parallel caused the decrease of milk cows numbers in this region. In the least favored region 4 for the alternative A, the milk cows numbers decreased from the 101 ths. heads (in the year 1999) on 77 ths. heads (in the year 2005), while for the alternative B on 90 ths. heads. In the region 1 (without subsidies for LFA), the number of milk cows increased on the 112.8 ths. heads and 106 ths. heads (from the 75 ths. heads in the year 1999) for the alternative A and B, respectively.. The corresponding average milk yield increased to 5 440 l/head, and 5 400 l/head, respectively (against the projected milk yield 5 280 l/head by the non-optimized allocation).

Scenario 2

The global result of the model AGRO-3 SR was the loss 8.5 bill. SKK partly compensated by the subsidy support of 7.4 bill. SKK and the total income was negative –1.1 bill. SKK. This is a consequence of the more pessimistic macroeconomics assumptions compared to the scenario 1. These results were influenced.also by the higher devaluation of SKK against USD. Against the scenario 1, there was obtained the improving of the agriculture trade balance by 1.5 bill. SKK, which is the consequence of the subsidized food industry export. Sales of the agriculture slightly increased as a consequence of the price growth. The agricultural trade balance slightly worsened (-4.4 bill. SKK). But the direct effect in agriculture is further worsening of its position and drawing of sources by the other link of the food chains. In this scenario, there were utilized 1 922 ha of agricultural land and reached sales from the agricultural production 67.1 bill. SKK. Parallel there was drawn 7.4 bill. SKK (similarly like in the scenario 1) for the subsidy supports (3.1 bill. SKK for LFA, i.e. 1 617 SKK/ha, and 4.3 bill. SKK for the production support) which represented 10% of the total income of the agricultural branch, but with the higher costs by 3.7 bill. SKK.

The consumer effect of this scenario consists in the food prices growth (1.404) under the inflation level (1.475) and under the level of the household income growth (1.534). Food expenditures (30.7%) present a worse result than the one in the scenario 1 (30.2%) by 0.5 percent point.

The results of the model AGRO-3 SR used in the model ALOKA (without optimization) led to the loss 7.1 bill. SKK, which is by 1.9 bill. SKK higher in comparison with the scenario 1. By the optimization with the model ALOKA, there were obtained the following results:

– in the alternative A – profit 3.5 bill. SKK (2 009 SKK per ha), subsidies 3.8 bill. SKK (2.6 for production, 1.2 for LFA), income with subsidies 7.3 bill. SKK, using off agricultural land 1 720 ths. ha (the optimized land use is by 500 ths. ha lower than the non-optimized one);
– in the alternative B – profit 3.6 bill. SKK (1 875 SKK/ha), subsidies 6.5 bill. SKK (4.8 for production, 1.7 for LFA), income with subsidies 10.2 bill. SKK, using off agricultural land 1 944 ths. ha (the optimized land use is by 276 ths. ha lower).

Scenario 3

The global results of AGRO-3 SR were: the loss 4.6 bill. SKK, high compensation by the support subsidy 12.1 bill. SKK, and the total income 7.6 bill. SKK. This loss is the lowest one from all scenarios which do not generate the price growth by the income growth release (scenarios 1, 2, 3). It is caused by the production expansion with the aim to reach the well-balanced agricultural trade up to the level of the desired 10% profitability of agriculture. In addition, this result shows that this aim was in decidisive measure reached by the growth of supports to the height 12.1 bill. SKK. This level corresponds even with the WTO limits. The drawn support reached the height 5.2 bill. SKK for the LFA (2 426 SKK/ha) and 6.9 bill. SKK for the production, which represents 17.2% from the total income of agriculture with the costs overcoming by 3.2 bill. SKK the agricultural costs in the scenario 1.

The total income of agriculture including subsidies (7.6 bill. SKK) corresponding to the desired 10% profitability (the total costs 75.1 bill. SKK) influenced the relative decrease of food consumer prices (index 1.328) and the same share of food expenditures, which can be considered as the revival of consumption. Further, the part of the agricultural production which went through the processing industry for the agricultural export reached the high level 5.2 bill. SKK and the passive trade balance decreased to –1.7 bill. SKK. One of the consequences was the decrease of the food industry exports with the parallel decrease of imports.

By analyzing these results, we can deduce that in the future the production surplus in agriculture will cause the increase of raw material exports and the decrease of the processed product exports (with respect to transformation relations of raw materials in the processing industry mirrored in the model AGRO-3 SR into market prices).

By the optimization with the model ALOKA, there were obtained the following results:

– in the alternative A – profit 3.8 bill. SKK (2 113 SKK per ha), subsidies 5.1 bill. SKK (3.0 for production, 2.1 for LFA), income with subsidies 8.9 bill. SKK, using off agricultural land 1 815 ths. ha (the optimization effect is the decrease of land use by 404 ths. ha)
– in the alternative B – profit 2.5 bill. SKK (1 178 SKK/ha), subsidies 8.7 bill. SKK (5.7 for production, 3.0 for LFA), income with subsidies 11.1 bill. SKK, use of agricultur-

Table 1. Results of the model simulations of the Slovak agricultural to the year 2005

Indicator	Units	Scenario 1			Scenario 2		
		basic	alternative		basic	alternative	
			A	B		A	B
The use of arable land – original	ths. ha	1,490.0	1,399.0	1,399.0	1,490.0	1,399.0	1,399.0
The use of arable land – optimized	ths. ha	1,350.2	1,099.6	1,133.3	1,353.8	1,117.0	1,133.9
Difference	*ths. ha*	*–139.8*	*–299.4*	*–265.7*	*–136.2*	*–282.0*	*–265.1*
The use of grass land – original	ths. ha	848.2	820.4	820.4	848.2	820.4	820.4
The use of grass land – optimized	ths. ha	508.9	658.4	809.9	508.9	602.7	809.9
Difference	*ths. ha*	*–339.3*	*–162.0*	*–10.5*	*–339.3*	*–217.7*	*–10.5*
The use of agricultural land – original	ths. ha	2,443.0	2,219.4	2,219.4	2,443.0	2,219.4	2,219.4
The use of agrucultural land – optimized	ths. ha	1,910.2	1,758.0	1,943.2	1,921.7	1,719.7	1,943.8
Difference	*ths. ha*	*–532.9*	*–461.4*	*–276.2*	*–521.3*	*–499.7*	*–275.6*
Optimized costs/ha agr. land	SKK/ha	37,641.0	35,309.7	32,191.7	39,356.2	37,570.0	33,448.2
Optimized costs total	bill. SKK	71,900.0	62,074.5	62,555.0	75,630.0	64,609.1	65,016.7
Optimized sales/ha agricultural land	SKK/ha	34,730.3	38,254.5	34,923.7	34,917.4	39,579.6	35,323.5
Optimized sales total	bill. SKK	66,340.0	67,251.4	67,863.7	67,100.0	68,065.1	68,661.8
Profit of the original size of production	bill. SKK		–5,223.9	–5,223.9		–7,112.5	–7,112.5
Optimized profit	bill. SKK	–5,560.0	5,176.9	5,308.7	–8,530.0	3,456.0	3,645.1
Difference	*bill. SKK*		*10,400.8*	*10,532.6*		*10,568.5*	*10,757.6*
Original profit/ha agricultural land	SKK/ha		–2,353.7	–2,353.7		–3,204.7	–3,204.7
Optimized profit/ha agricultural land	SKK/ha	–2,910.8	2,944.8	2,731.9	–4,438.8	2,009.7	1,875.2
Difference	*SKK/ha*		*5,298.5*	*5,085.7*		*5,214.4*	*5,079.9*
Production subsidies/ha agricultural land	SKK/ha	2,256.6	1,304.2	2,484.2	2,256.4	1,502.0	2,481.1
Production subsidies total	bill. SKK	4,310.5	2,292.7	4,827.3	4,336.1	2,583.0	4,822.8
Optimized income with the production subsidies/ha agricultural land	SKK/ha	–654.2	4,248.9	5,216.1	–2,182.4	3,511.7	4,356.4
Optimized income with the production subsidies	bill. SKK	–1,249.6	7,469.6	10,136.0	–4,193.9	6,039.0	8,467.9
Subsidies for LFA/ha agricultural land	SKK/ha	1,617.0	759.9	885.8	1,617.0	718.6	883.3
Subsidies for LFA total	bill. SKK	3,088.7	1,335.9	1,721.3	3,107.4	1,235.7	1,717.0
Subsidies total	bill. SKK	7,399.2	3,628.6	6,548.6	7,443.5	3,818.7	6,539.8
Optimized income with all subsidies/ha agricultural land	SKK/ha	962.8	5,008.8	6,102.0	–565.4	4,230.2	5,239.7
Optimized income with all subsidies total	bill. SKK	1,839.2	8,805.5	11,857.3	–1,086.5	7,274.7	10,184.9

al land 2 089 ths. ha (the optimization effect is the decrease of land use by 130 ths. ha).

In this scenario like in the scenario 1, alternative B, the commodity production supports compensate sufficiently production losses, if the production is optimally allocated by commodities.

Scenario 4

In this scenario, there were used macroeconomic assumptions from the macroeconomic prognosis of Infostat with the exception of the household income growth, which is in this case considered as a variable (in the sense of the definition of this scenario).

The global result of AGRO-3 SR was the total profit of the agricultural branch at the level 7.5 bill. SKK. It is evident that this is the only scenario where there was reached profit in the basic step. This effect was caused by the price growth under the condition that the whole production surplus must be exportable either below the world prices level without export subsidies, or up to the WTO limits in case of the subsidized exports.

The total subsidy supports were on the comparable level with the other scenarios and reached 9% of the total income of the whole agricultural branch.

From the total agrofood export (8.7 bill. SKK), the subsidized export (with the export subsidies 1.7 bill. SKK) represented 3.4 bill. SKK. The market limits influenced the fact that in spite of the big stimulation of the production growth the agrifood exports reached the lowest level of all scenarios, which denotes the relatively low competitiveness of the food industry. If the food industry would want to be profitable, then it would have to increase its prices over the level of reference prices and, as a consequence, to decrease their export competitiveness. The passive trade balance would be in this case the highest one of all scenarios (4.5 bill. SKK).

Continuation Table 1

Indicator	Units	Scenario 3			Scenario 4		
		basic	alternative		basic	alternative	
			A	B		A	B
The use of arable land – original	ths. ha	1,490.0	1,399.0	1,399.0	1,490.0	1,399.0	1,399.0
The use of arable land – optimized	ths. ha	1,468.4	1,260.5	1,279.1	1,358.4	1,102.9	1,138.5
Difference	*ths. ha*	*–21.6*	*–138.5*	*–119.9*	*–131.6*	*–296.1*	*–260.5*
The use of grass land – original	ths. ha	848.2	820.4	820.4	848.2	820.4	820.4
The use of grass land – optimized	ths. ha	611.5	554.6	809.9	508.9	662.9	809.9
Difference	*ths. ha*	*–236.7*	*–265.8*	*–10.5*	*–339.3*	*–157.5*	*–10.5*
The use of agricultural land – original	ths. ha	2,443.0	2,219.4	2,219.4	2,443.0	2,219.4	2,219.4
The use of agrucultural land – optimized	ths. ha	2,130.8	1,815.1	2,089.0	1,918.3	1,765.8	1,948.4
Difference	*ths. ha*	*–312.2*	*–404.3*	*–130.4*	*–524.7*	*–453.6*	*–271.0*
Optimized costs/ha agricultural land	SKK/ha	35,253.7	36,508.2	32,691.3	39,216.2	34,345.6	31,999.5
Optimized costs total	bill. SKK	75,120.0	66,266.0	68,292.2	75,230.0	60,647.5	62,347.8
Optimized sales/ha agricultural land	SKK/ha	33,099.6	38,621.5	33,868.9	43,141.5	48,623.6	44,382.9
Optimized sales total	bill. SKK	70,530.0	70,101.8	70,752.2	82,760.0	85,859.6	86,475.6
Profit of the original size of production	bill. SKK		–5,663.7	–5,663.7		14,299.3	14,299.3
Optimized profit	bill. SKK	–4,590.0	3,835.8	2,460.0	7,530.0	25,212.1	24,127.8
Difference	*bill. SKK*		*9,499.5*	*8,123.7*		*10,912.8*	*9,828.5*
Original profit/ha agricultural land	SKK/ha		–2,551.9	–2,551.9		6,442.9	6,442.9
Optimized profit/ha agricultural land	SKK/ha	–2,154.1	2,113.3	1,177.6	3,925.3	14,278.0	12,383.4
Difference	*SKK/ha*		*4,665.2*	*3,729.5*		*7,835.1*	*5,940.5*
Production subsidies/ha agricultural land	SKK/ha	3,255.7	1,664.0	2,709.2	2,252.8	313.6	2,487.6
Production subsidies total	bill. SKK	6,937.4	3,020.4	5,659.5	4,321.6	553.8	4,846.9
Optimized income with the production subsidies/ha agricultural land	SKK/ha	1,101.6	3,777.3	3,886.8	6,178.1	14,591.6	14,871.0
Optimized income with the production subsidies	bill. SKK	2,347.4	6,856.2	8,119.5	11,851.6	25,765.9	28,974.7
Subsidies for LFA/ha agricultural land	SKK/ha	2,425.5	1,136.8	1,439.7	1,617.0	765.9	887.0
Subsidies for LFA total	bill. SKK	5,168.3	2,063.4	3,007.4	3,102.0	1,352.4	1,728.2
Subsidies total	bill. SKK	12,105.7	5,083.8	8,666.9	7,423.6	1,906.2	6,575.1
Optimized income with all subsidies/ha agricultural land	SKK/ha	3,527.1	4,914.1	5,326.4	7,795.1	15,357.5	15,758.0
Optimized income with all subsidies total	bill. SKK	7,515.7	8,919.6	11,126.9	14,953.6	27,118.3	30,702.9

The food expenditures decreased to the level 28.8% (the lowest value of all scenarios) even with respect to the fact that the part of the household income growth was allocated into the non-food products. The food price index reached the value 1.522, but this growth was acceptable with respect to the model generated household income growth (1.861).

By the optimization with the model ALOKA, there were obtained the following results

– in the alternative A: profit 25.2 bill. SKK (14 278 SKK per ha), subsidies 1.9 bill. SKK (0.6 for production, 1.3 for LFA, which means that the agricultural production filled in agricultural areas mainly in regions with the low level of LFA support), income with subsidies 27.1 bill. SKK, use of agricultural land 1 766 ths. ha (difference from the non-optimized allocation is 454 ths. ha)
– in the alternative B: profit 24.1 bill. SKK (12 383 SKK per ha), subsidies 6.6 bill. SKK (4.9 for production, 1.7 for LFA), income with subsidies 30.7 bill. SKK, use of agricultural land 1 948 ths. ha (difference from the non-optimized allocation is 271 ths. ha)

CONCLUSIONS

Basic scenarios

The best results were reached in the scenario 4 by the price liberalization in the whole food chains with the parallel growth of sources for their acceptance. This scenario, similarly like the scenario 2, proved the importance of the macroeconomic environment for the profitability and production ability of the agriculture and food industry and for maintaining of the self-sufficiency in the basic food products.

In the scenarios 1, 2, 4 of the model AGRO-3 SR, the support level is nearly the same, but the different macroeconomic environment generated the important differ-

Table 2. Total characteristics of the model scenarios

Indicator	Units	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Export subsidies	bill. SKK	0.9	0.9	1.0	1.7
Food prices (r. 1999=1)	index	1.330	1.404	1.328	1.552
Inflation (r. 1999=1)	index	1.465	1.475	1.465	1.465
Population income (r. 1999=1)	index	1.517	1.534	1.517	1.861
Food expenditures / total expenditures	%	30.21	30.72	30.20	28.75
Agricultural export without subsidies	bill. SKK	0.90	1.00	5.16	0.69
Agricultural export with subsidies	bill. SKK	0.00	0.00	0.00	0.71
Agricultural export	bill. SKK	0.90	1.00	5.16	1.40
Agricultural import	bill. SKK	5.03	5.40	6.82	7.05
Trade balance	bill. SKK	–4.13	–4.40	–1.66	–5.65
Food industry export without subsidies	bill. SKK	6.73	7.76	4.37	4.59
Food industry export with subsidies	bill. SKK	1.37	1.53	3.73	2.71
Food industry export	bill. SKK	8.10	9.29	8.10	7.30
Food industry import	bill. SKK	7.36	6.81	6.44	6.18
Trade balance	bill. SKK	0.74	2.48	1.66	1.12
Agrifood export without subsidies	bill. SKK	7.63	8.76	9.53	5.28
Agrifood export with subsidies	bill. SKK	1.38	1.53	3.73	3.42
Agrifood export	bill. SKK	9.01	10.29	13.26	8.70
Agrifood import	bill. SKK	12.40	12.21	13.26	13.23
Trade balance	bill. SKK	–3.39	–1.92	0.00	–4.53

ences in the total income, from the loss –1.1 bill. SKK to the profit 14.9 bill. SKK (which is comparable with the EU level). Similarly, the big differences were obtained in the passive agricultural trade balance (from –1.9 to –4.5 bill. SKK), and in the growth of consumer food price index (from 1.33 to 1.55).

The scenario 3 was specific not only in indicating the size of subsidies needed for elimination of policy and market distortion, but even for indicating the production structure needed for the desired 10% profitability and well-balanced trade of the Slovak agriculture.

Optimized variants

Results of the model ALOKA indicated the high potential possibilities of the Slovak agriculture to increase the profitability by the way of regional production allocation. All the alternatives A have shown that under the optimal allocation of the agricultural production the production subsidies can be reduced. Let us note that the saved financial sources have to be used for the support of the multifunctional goals of agriculture, mainly in LFA due to the production extensity.

REFERENCES

Božík M. (2001): Consequences of Applications of the Conception of Agrarian a Food Policy till the Year 2005 and Effects of the Optimized Production Allocation in the Slovak Republic. Internal study (in Slovak). Research Institute of Economics the Agriculture and Food Production, Bratislava, Slovak Republic.

Foltýn I., Zedníčková I. (2001): Mathematical model AGRO-3 for simulations and predictions of agrarian policy impacts on the agrarian sector. Agric. Econ. (Czech Academy of Agricultural Sciences), *47*, pp. 1–5.

Foltýn I., Zedníčková I. (1998): Model of the Agricultural Sector of the Czech Republic (AGRO-3) and Modeling of the Agrarian Policy (in Czech). Proceedings of the international conference The Agrarian Prospects VII, Czech University of Agriculture, Prague, pp. 440–447.

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