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MAKING AGRICULTURAL SUPPORT MORE OBJECTIVE-ORIENTED: LINEAR PROGRAMMING APPROACH FOR UKRAINE

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In this article we investigate how to integrate the experience and knowledge of local agricultural experts in order to facilitate more objective-oriented use of the agricultural support funds. For this purpose we apply the Linear Programming methodological approach. Within this approach the model for calculating the optimum allocation of agricultural budget is developed. The evaluations criterions, which are used in the modeling, are derived during the interviews with agricultural experts who work at the Zdolbuniv district agricultural department in Ukraine.

The outcomes show that the agricultural support should have been redistributed in a slightly different way from the district perspective. However, the calculated changes in most cases match with the overall development directions in the Ukrainian agricultural support policy. Furthermore, the developed model has proved to be a useful and, at the same time, quite simple in application support tool, which could have been used by the agricultural decision-makers in the process of agricultural support distribution.

Keywords: *Agricultural support, impact assessment, Linear Programming.*

1 INTRODUCTION

The usefulness means and scale of state agricultural support has been already discussed many times by scholars from both developed and developing countries. A lot of scientific attention is paid to this field, because of the unique particularities of agriculture and its important role in the food security of the state and life of the society (DIBROVA 2009). In the European Union (EU) the "evolution" of Common Agricultural Policy (CAP) has eventually led to the shift from production support to rural development support and enhancement of agri-environmental measures (EC 2010).

The state agrarian policy of Ukraine considers the necessity of country's integration into the EU (VRU 2005a, article 1). As a result, Ukraine also proclaimed social and economic developments of rural settlements as one of its agrarian policy main priorities. However, despite this fact, still a large part of its agricultural budget is spent on agricultural production support (VRU 2007, VRU 2008, VRU 2010). Also, in the current conditions of restricted budgetary resources it is especially important to rationalize agrarian policy, optimize financial support of agriculture and enhance the efficiency of budget expanses (BOJDA 2006).

Starting from 1991 the allocation of agricultural budget is adopted on the level of Verkhovna Rada of Ukraine (VRU) and Ministry of Agrarian Policy of Ukraine (MAPU). The overall objective pursued in the agrarian policy is to improve social economic conditions of 3.5 million peasants engaged in agriculture and 14.7 million citizens living in rural areas (MAPU 2008a, MAPU 2008b). However, the experts of the district state administration (DSA) agricultural departments, who know all the social economic particularities of specific areas and work directly with the farmers and agricultural entrepreneurs, are not integrated in the decision-making process concerning agricultural funds distribution. But, how could be those possible suggestions and propositions from the district level made, if the criteria on how these funds should be allocated either do not exist or are not known to the public including regional level state authorities? Which instruments, models and methods could have been employed to provide the support for the agricultural decision-makers in charge on the district level?

The Ukrainian society has been actively evolving recently and more and more attention is paid to the challenge of optimum use of state funds as well as engaging regional representatives in the process of national policy formulation. So, it is necessary to further investigate the agricultural support status in Ukraine and compare it with the available, confirmed by reality international experience. The knowledge obtained from the investigation could be used to contribute both to the process of finding the answers to the above-mentioned questions and the development of model which would suit the specific features of Ukraine and would help to build the competitive, profitable and environmentally friendly agricultural sector.

The research is guided by two particular objectives: *to analyze the recent distributions of agricultural budgets in Ukraine (1); to develop a model for calculating an agricultural budget allocation based on realistic, objective and independent from personal preferences district agricultural experts' judgments (2).*

The first objective is reached by making a thorough review of existing official documents related to agricultural support and analyzing relevant scientific papers. The methodological approach that is used to reach the second objective comprises the development of a model based on Linear Programming (LP) approach. The judgments of official agricultural representatives received during the interviews in the case study Zdolbuniv district are further integrated in the model.

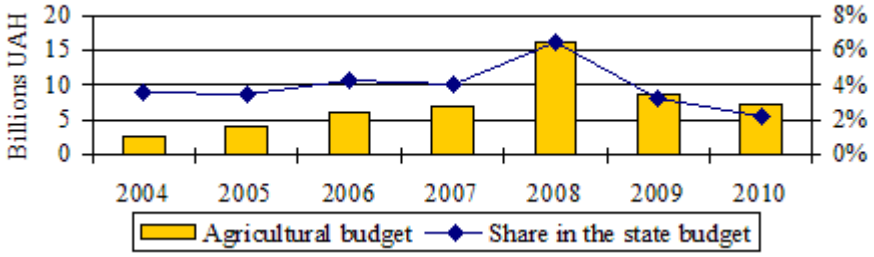
The paper proceeds as follows. In the next chapter the agricultural budgeting in Ukraine is analyzed. After that, the case study Zdolbuniv district is described. Next, methodology and data obtained in the scope of the case-study are presented. Following, the results of modeling are presented and discussed. Finally, conclusions and potentials fields for future research are drawn.

2 AGRICULTURAL BUDGETING IN UKRAINE

The current year experience has shown that Ukraine remains quite unpredictable in the sphere of budgetary planning. The country has lived almost the third part of the year without the main financial document which is the budget. This meant zero amount of Ukrainian Hryvnia (UAH) for agricultural support from January till April 2010. But, finally the budget was adopted on the 27 of April 2010 (VRU 2010) and can be compared with the ones from the previous years.

Starting from 2004 the agricultural share in the whole budget had slowly increased from 3.5% to 6.4% in 2008 (fig. 1). Based on this tendency the predictions had been made that agricultural issues were of growing concern among the state political leaders and more financial resources would be "invested" by the state into the agricultural sector[1]. But, then the agricultural share became twice as small (3.2%) in 2009, as in the previous year. In 2010 its share in the whole budget reduced even more comprising only 2.2%.

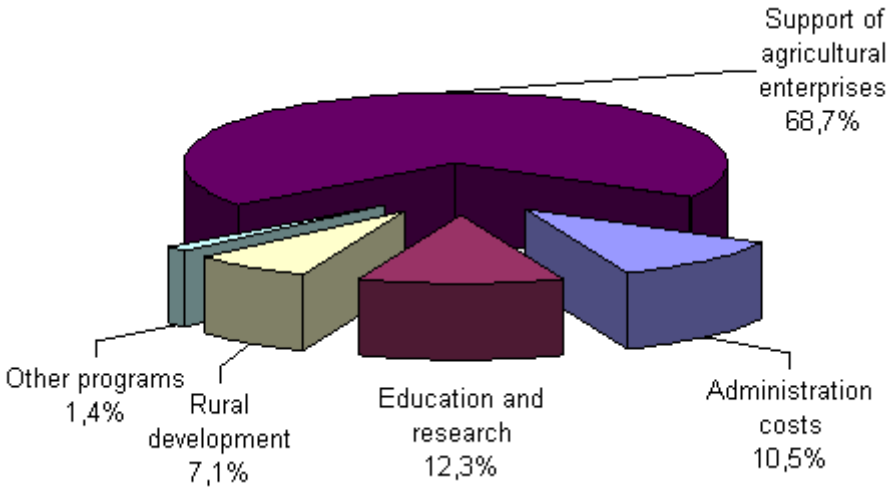
Figure 1. Share of agricultural budget in the state budget of Ukraine, 2004 to 2010



Source: Own compilation based on data from VRU 2003, VRU 2004, VRU 2005b, VRU 2006-2008, VRU 2010.

Although Cabinet of Ministers of Ukraine (CMU) adopted "The State Program of Rural Development till 2015" on 19.09.2007 (CMU 2007) and proclaimed it of first-rate importance, the rural share in agricultural budget comprised only 7.1% in 2008 (fig. 2) In that year the largest amount of money (68.7%) went to support the agricultural enterprises. Among the "Support of agricultural enterprises" group the largest shares belonged to subsidies for animal production, compensation of commercial banks credits interest rate, state market interventions and state compensation of pension tax (VRU 2007).

Figure 2. Distribution of agricultural budget in Ukraine, 2008



Source: Own compilation based on data from VRU 2007.

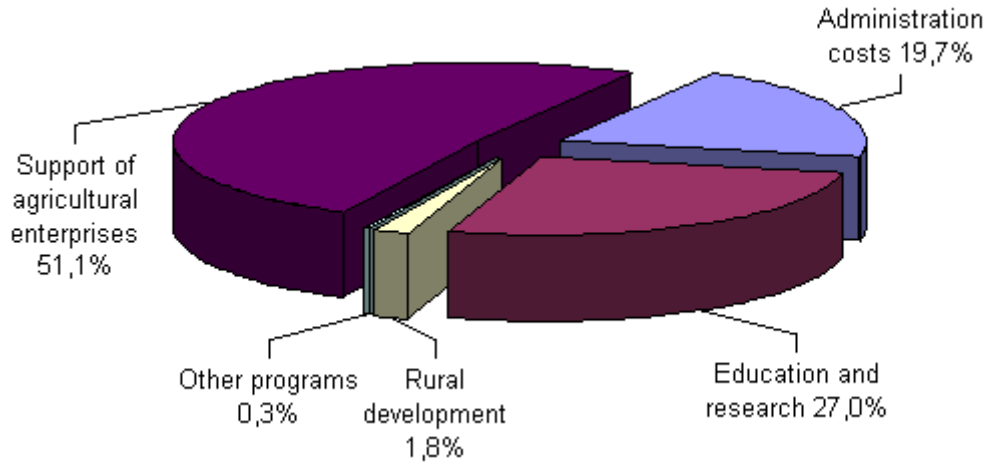
The next general evaluation can be given regarding the 2008 budget:

[1] This statement is based on the opinions of the agricultural department's experts in Zdolbuniv district.

- about 60% of agricultural budget (VRU 2007) falls into "yellow box", according to World Trade Organization (WTO) classification, which is larger than the same indicator in the EU (KOBOUTA et al. 2009: 16);
- both, complex development of rural areas and Ukraine's integration into the EU are proclaimed as important targets of agrarian policy (VRU 2005). At the same time, rural development share comprised about 20% of the EU agricultural budget in 2008 (EC 2010). Therefore, if the Ukraine's integration into the EU anticipates that Ukraine is to copy the model of agricultural support distribution in the EU, than the "Rural development" section in the Ukrainian agricultural budget also need to be enhanced (fig. 2);
- 12.3% for "Education and research" could be evaluated as a relevant figure, but only if it is really supported by the increase in the number of well-educated agricultural graduates.

The 2009 agricultural budget is quite different comparing with the previous year. First of all, it can be seen from figure 1 that it is almost two times smaller in the monetary terms. If in 2008 the rural development support did not occupy a very large part of the agricultural budget, then in 2009 it was even less comprising only 1.8% of the budget (fig. 3). The monetary amount of resources spent on administration costs and education and research were almost the same in 2009 as in 2008, but as the whole amount of 2009 budget decreased the shares of these budgetary fields doubled making 19.7% and 27% respectively.

Figure 3. Distribution of agricultural budget in Ukraine, 2009



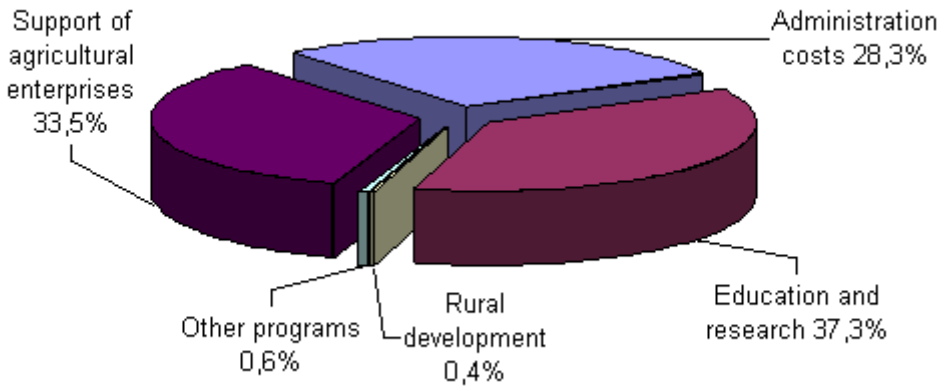
Source: Own compilation based on data from VRU 2008.

The increase of "green" measures' share in the whole budget till 50% in 2009 was gained only as a result of cutting off the amount of budgetary funds spent on "yellow" programmes and not because of its redistribution towards the "green" ones or increase of spending on the last (VRU 2008).

As well as in 2009, the amount of 2010 agricultural budget was once again diminished. The "Rural development" share continued to decrease and was only 0.4% in 2010 (fig. 4). As in 2009, the shares of "Administration costs" and "Education and research" increased partly due to the decrease of the whole budget (fig. 1). Once again the biggest reduction, of almost 100% comparing with the previous year, touched the "Support of agricultural enterprises" part (VRU 2008, VRU 2010). No more money is going to be spent on the compensation of commercial banks credits interest rate and the state compensation of pension tax and only little amount on state market interventions (VRU 2010). At the same time, when in 2008 about 60% of agricultural budget fell

into "yellow box", in 2010 less than one third of agricultural budget is spent on "yellow" programmes[2] (VRU 2010).

Figure 4. Distribution of agricultural budget in Ukraine, 2010



Source: Own compilation based on data from VRU 2010.

3 AGRICULTURAL SECTOR OF RESEARCH DISTRICT

Zdolbuniv district is an administrative part of Rivne region which is situated in the north-western part of Ukraine. The population of the district is 57,9 thousand citizens among which 18,6 thousand live in the rural area (ZDOLBUNIV DSA 2010). Table 1 depicts the main socio- economic indicators in Zdolbuniv district.

Table 1. Main socio-economic indicators in Zdolbuniv district, 2009

		Zdolbuniv district	Ukraine
GDP per citizen	in UAH	8673,6	19862,33
Employment rate	in %	54,5	64,7
Unemployment rate	in %	13,2	9,6

Source: Own compilation based on ZDOLBUNIV DSA 2010 and http://www.ukrstat.gov.ua/.

Generally the socio-economic indicators in Zdolbuniv district are worse than average in Ukraine. Gross Domestic Product (GDP) per citizen is more than two times smaller; employment rate is on 10.2% lower while unemployment rate is on 3.6% higher. Of course, the enhancement of job opportunities and increase of income in agricultural sector could lead to the overall improvement of the socio-economic situation in the district. That is one of the reasons why it was decided to base this research on Zdolbuniv agricultural sector example.

The contribution of agricultural sector into the Zdolbuniv district's GDP had been changing between 2006 and 2008. It comprised the biggest share of 21% in 2005 and the lowest of 12% in 2008 (DROZD 2009). However, this share had been always larger during the mentioned period than the average one in Ukraine. Therefore, it might be concluded that the agricultural sector plays quite an important role in the economics of Zdolbuniv district.

The employment opportunities within the agricultural enterprises of Zdolbuniv district have declined from 2006 till 2008 (DROZD 2009). Furthermore, the average salary of the workers engaged in agricultural production was also less than the one in other spheres of activities during the same period. While the job opportunities are decreasing and agricultural income is the lowest,

[2] Actually, in 2010 Ukraine used only 79% of the Aggregate measurement of support amount, which was set at the amount of 3 043 million of UAH when Ukraine joined World Trade Organization (VRU 2010).

the size of agricultural budget in Zdolbuniv district in 2009 sharply diminished in almost four times when comparing with the previous year (DROZD 2009).

At the same time, the volume of agricultural production does not fluctuate so quickly. Therefore, it is very important for the agricultural producers and state agricultural representatives in Zdolbuniv district to be able to adjust to such changes. That's why, it was proposed to investigate the possible scientific "inventions" which could support in finding the "optimum" allocation of agricultural funds in Zdolbuniv district under such conditions.

4 LINEAR PROGRAMMING APPROACH

The application of a linear programming approach with the purpose of deciding which agricultural policy measures should be financed to meet the particular objectives in the best possible way was introduced by JECHLITSCHKA, KIRSCHKE and SCHWARZ (2007). Also they describe the way on how to implement this method in MS-Excel.

The objective function can be defined as follows (KIRSCHKE et al. 2007: 3):

$$Z_1 = \sum_{i=1}^{n} z_{1i} \cdot B_i$$

with:

Z_1	1st objective
B_1	budgetary expenses for a measure i
i = 1, …, n	index of the respective measure considered
z_{1i}	constant marginal and average coefficient of the objective function describing the impact of the budgetary expanses for measure i on the 1st objective.

In fact, often the policies measures are implemented to meet several objectives (VRU 2005a). If there are, e.g., two objectives determined, an aggregated objective function can be defined by putting together both objectives functions giving weights:

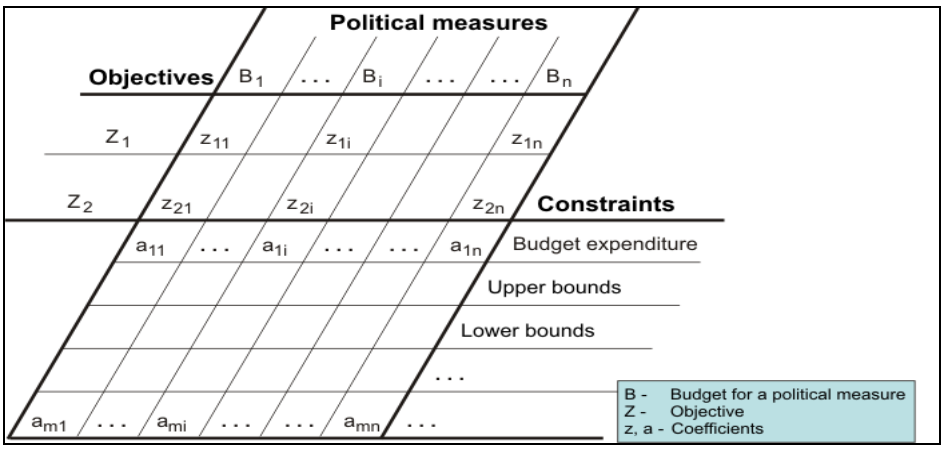
$$Z = (1-\alpha)Z_1 + \alpha Z_2$$

with (1-α) and α being weighting factors.

The weighting factors (1-α) and α represent the contribution of the objectives Z_1 and Z_2 in the objective function Z. If more objectives have to be included in the decision-making process, it is recommended to consider them as restrictions in order to avoid possible difficulties (KIRSCHKE et al. 2007).

Figure 5 shows the matrix which represents the approach comprising two objectives. z_{1i} and z_{2i} stay for constant marginal and average coefficient of the objective function and subsequently represent the impact of budgetary funds, spent to finance specific measures, on the objectives.

Figure 5. Structure of the programming approach



Source: KIRSCHKE et al. 2007: 4.

Finally, the described optimization approach may be formulated as follows (KIRSCHKE et al. 2007: 4):

$$\max_{B_1,\ldots,B_n} Z = (1-\alpha)\cdot\sum_{i=1}^{n} z_{1i}B_i + \alpha\cdot\sum_{i=1}^{n} z_{2i}B_i$$

subject to: $\sum_{i=1}^{n}\alpha_{ri}B\begin{Bmatrix}\leq\\=\\\geq\end{Bmatrix}b_r$ for r = 1, …, m and $B_i \geq 0$ for i = 1, …, n

where:

r = 1, …, m	is the index of restrictions (equations or inequations)
a_{ri}	is the coefficient of restriction r for measure i
b_r	is the right hand side of restriction r.

In order to fill the matrix of figure 5 according to a particular problem setting, the following steps need to be undertaken:

- the political measures which are relevant need to be chosen;
- the objectives need to be chosen and agreed with the stakeholders who are competent in the particular sphere;
- the assessment of the coefficients of the objective function need to be done;
- the relevant restrictions have to be incorporated.

The process and results of fulfilling the above-mentioned steps with regard to the case study Zdolbuniv district are described in the following section.

5 GENERATION OF INPUT PARAMETERS

5.1 Measures considered

The input parameters were generated as the result of overview of agricultural normative documents in Ukraine and the discussion with the district agricultural experts (just experts in the following) about the actual situation in Zdolbuniv district.

The list of measures, which are financed by the state agricultural budget, changes yearly with the adoption of the budget for the following year. Some of them remain the same, some might disappear while some new ones might be introduced (VRU 2003, VRU 2004a, VRU 2005b, VRU 2006-2008, VRU 2010). Also the number of measures financed in each particular district might differ. Therefore, it was agreed with the experts to use for the model the aggregated list of measures

which have been financed in Zdolbuniv district at least during one year in the period from 2005 to 2009. This list, which is presented in table 2, consists of eleven measures.

Table 2. Measures considered in the model

M1	Breeding in animal and poultry production on the enterprises of agricultural sector.
M2	Budgetary state subsidies for the support of animal and plant production.
M3	Breeding in plant production.
M4	Financial support of agricultural enterprises through the mechanism of subsidizing commercial banks credits.
M5	Creating reserve stocks of hybrid high-quality seeds.
M6	Planting and looking after young orchards.
M7	Reimbursement of the cost of domestically produced agricultural equipment.
M8	Financial support of farm enterprises.
M9	Farm enterprises crediting.
M10	State support of hop growing development.
M11	Partly recovering of the insurance costs.

Source: Own compilation.

It was decided to take 2008 year as the basis for model definition, because in that year the Zdolbuniv agricultural budget was the largest and the biggest number of measures (eight) were financed during that year. All interviewed experts have been working in the agricultural department of Zdolbuniv state administration for more than *eight* years. Hence, they might be regarded as being enough credible to evaluate the above-listed measures.

5.2 Selection of objectives

The criterions defined for the evaluation of state agrarian policy efficiency in the Law of Ukraine „About Main Principles of State Agrarian Policy for the Period till 2015" (VRU 2005a) were proposed to be used as objectives for the impact assessment of the above-mentioned measures.

During the discussion of these objectives with experts, all of them appraise the *Creating job opportunities* (1) and *Income increase* (2) objectives as relevant for the evaluation of agrarian policy effectiveness. The choice of these objectives is also validated by the decrease of employment opportunities in the Zdolbuniv agricultural sector and the low income level in the agricultural sphere (DROZD 2009). Furthermore, these two objectives are also included in the district agricultural development program as priority targets and the experts had no difficulties with assessment of the measures' contribution into these objectives' achievements.

5.3 Impact assessment

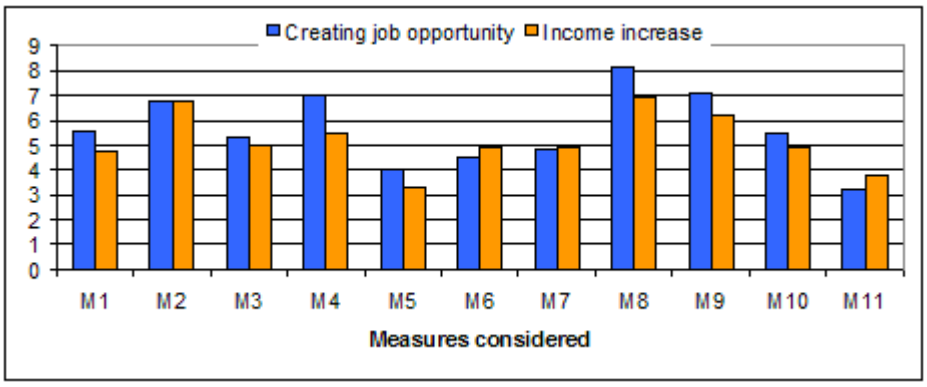
After agreeing on measures and objectives it is necessary to evaluate the impact of these measures with regard to the defined objectives. The impact assessment might be based, e.g., on calculations of net welfare effects from the implementation of certain measures or computations of indicators of economic effectiveness of the measures. However, this research is more focused on

presenting a method which would enable to integrate the experience and knowledge of agricultural experts in the process of agricultural budget redistribution. Furthermore, it might be quite hard to calculate, in "hard" numbers and relying only on statistical data, the impact from each political measure implemented with respect to the objectives.

That is why, the six experts from agricultural department of Zdolbuniv DSA were asked during individual interviews to make their judgments based on one-dimensional 1-9 scale. Such a simple scale is argued by JECHLITSCHKA et al. (2007: 201) to be an appropriate for the generation of coefficients of the objective function. The coefficients 1,2,3 would indicate a small contribution of a measure to an objective, the coefficients 4,5,6 – a medium contribution, and the coefficients 7,8,9 – a high one.

Figure 6 depicts the geometric means of the measure-specific impact parameters with regard to objective one and two. It has been proved in the theory that it is better to use the geometric mean to aggregate individual expert judgments into a single representative judgment for the entire group (SAATY 2008: 95). Application of geometric mean weakens the influence of extreme values in the analyzed range of data on the final mean. Two tendencies can be summarized from figure 6. First, the impact parameters of each particular measure with regard to both objectives do not differ significantly. Second, in most cases the experts assigned higher contribution estimates for objective one (creating job opportunity). Such judgments might be partly explained with the opinions expressed by the experts during the interviews that "both objectives are interrelated" and "it is more likely that new jobs will be created than income will increase".

Figure 6. Impact parameters (geometric means) for objective one and two



Source: Own compilation.

The measures which received the lowest estimates (M5 and M11) were not financed during the last two years. But, there is no evidence whether the experts were significantly influenced by this fact. Furthermore, the *breeding in plant production* (M3) was also not financed in 2008 and 2009 but still this measure received an average judgment.

The *production subsidy* measure (M2) which comprised more than half of Zdolbuniv agricultural budgetary resources in 2008 and 2009 received high estimates with regard to both objectives. At the same time, the second-highest financed measure on *hop growing development* (M10) was evaluated with medium impact estimates. Also it should be noticed that experts assigned the highest estimates for the measures which are focused on supporting farm enterprises (M8 and M9), although their shares in the budgets are not large.

5.4 Constrains incorporated

Based on the discussion with the experts it was figured out that the model is only restricted by upper and lower bounds and amount of the budget available. According to the Ukrainian legislation, there are no comprehended interrelations between the amounts of measures financed. Everything is

financed only from the national budget through regional and district administrations to the final "consumers".

Therefore, it was agreed to stay with "realistic"[3] 20% of upper bounds (UB) and lower bounds (LB) change for each measure considered. For the three measures which were not actually financed during 2008 but are incorporated in the model it was decided to set UB at the level of regional average for the specific measure and LB at zero. Also the second constrain is that the district agricultural budget has to be spend completely, but the whole amount of money defined for the district in the particular year can not be changed.

Other constrains, which could have been incorporated in the model, concerning total land area available or number of animals kept (in case of area or animal based payments), the number of farmers in district (in case of direct investment payments), the value of credits taken (in case of reimbursement of interest rate) have been also considered. However, they do not restrict the model, because the district absorption capacity[4] allows to spent more money on agricultural support measures than is restricted by UB.

6 MODEL DEFINITION AND EXPLORATION OF ITS OPTIMIZATION POTENTIALS

The agricultural budget of Zdolbuniv district constituted in 2008 6,05 mio. UAH. This money was distributed between eight measures. All of them belong to the "Support of agricultural enterprises" group according to the national legislation (VRU 2007). The input parameters for the modeling of agricultural budget allocation in Zdolbuniv district, which are described in the previous section, are summarized in numbers in table 3.

Table 3. Coefficients for the measures financed and model variables matrix (ths. UAH)

1.		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	Sum
2.	**Current allocation**	205,6	4499,1	0	81,2	0	12	356,3	126,05	231,1	534,7	0	6046,05
3.	**Optimal allocation**	164,48	4758,07	0	64,96	0	9,6	285,04	151,26	184,88	427,76	0	6046,05
4.	**Objective 1: Creat. job opport.**	5,54	6,78	5,30	6,98	4,06	4,51	4,85	8,14	7,09	5,46	3,23	
5.	**Objective 2: Income increase**	4,75	6,78	5,01	5,49	3,30	4,91	4,93	6,92	6,23	4,92	3,80	
6.	**Regional budget upper bounds**	2551	59628	1837	33673	408	7567	2041	1224	2245	841	2041	114057
7.	**Upper bounds**	246,72	5398,92	189,07	97,44	42,02	14,4	427,56	151,26	277,32	641,64	210,08	7696,43
8.	**Lower bounds**	164,48	3599,28	0	64,96	0	9,6	285,04	100,84	184,88	427,76	0	4836,84

[3] *De jure* the upper bound for the district by each financed measure is limited by two amounts: the size of all regional money planned for this measure in the following year and the overall size of district agricultural budget. But, *de facto* the experts' experience shows that it is realistic to change the received distribution in the frames of about 20%.

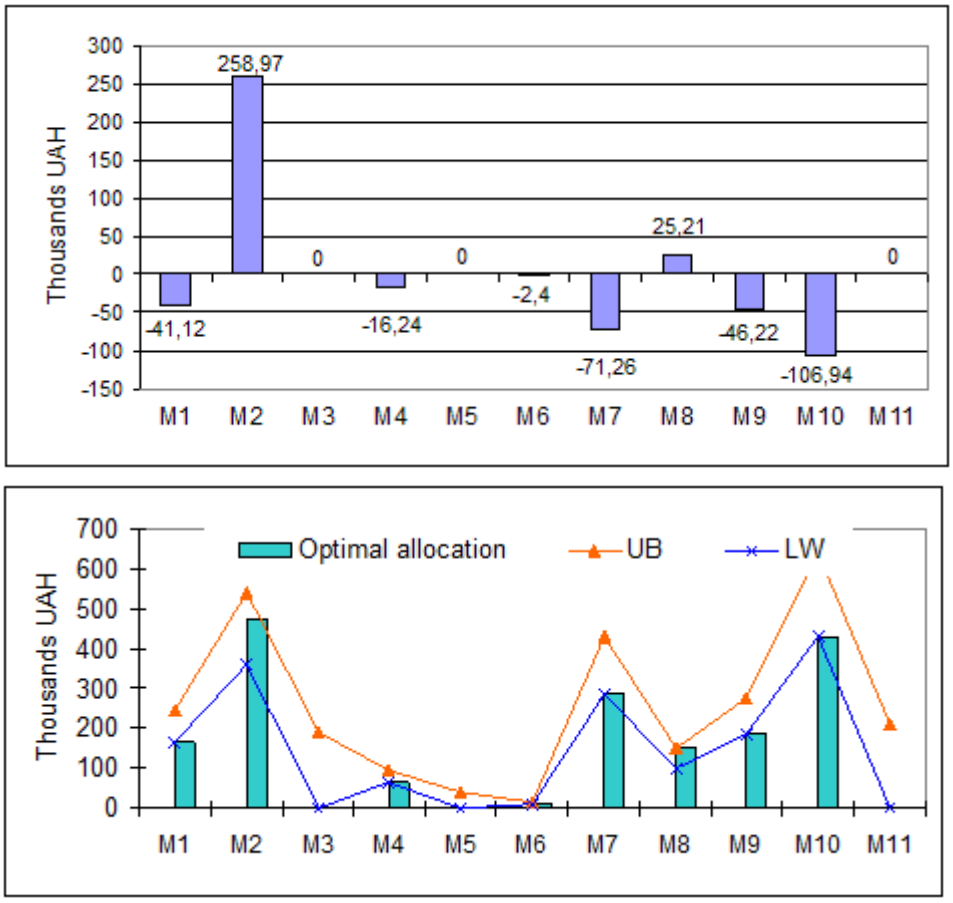
[4] District absorption capacity can be defined as the capacity of the region to effectively utilize the flowing external financial resources (c.f. CHMIELINSKI 2006: 94).

Source: Own compilation and calculations.

In row 2 the agricultural budget allocation of Zdolbuniv district in 2008 is displayed (reference situation). The calculated optimal, which is based on experts judgments represented in rows 4 - 5, is shown in row 3. In row 6 the regional budget limits with respect to each financed measure are displayed followed by upper and lower bounds for the case study Zdolbuniv district (rows 7 - 8).

Figure 7 depicts the differences between the optimal and reference allocation of Zdolbuniv agricultural budget. The three measures M3, M5 and M11, which were financed on the regional level but not on the district one, do not appear in the optimal allocation as well. In this case, the experts' evaluation matches with the actual distribution. However the rest eight measures should have been supported differently from the experts' perspective. The financing of two of them (M2 and M8) should be increased, while the financing of the other six left should be diminished.

Figure 7. Allocation changes with respect to the reference situation*

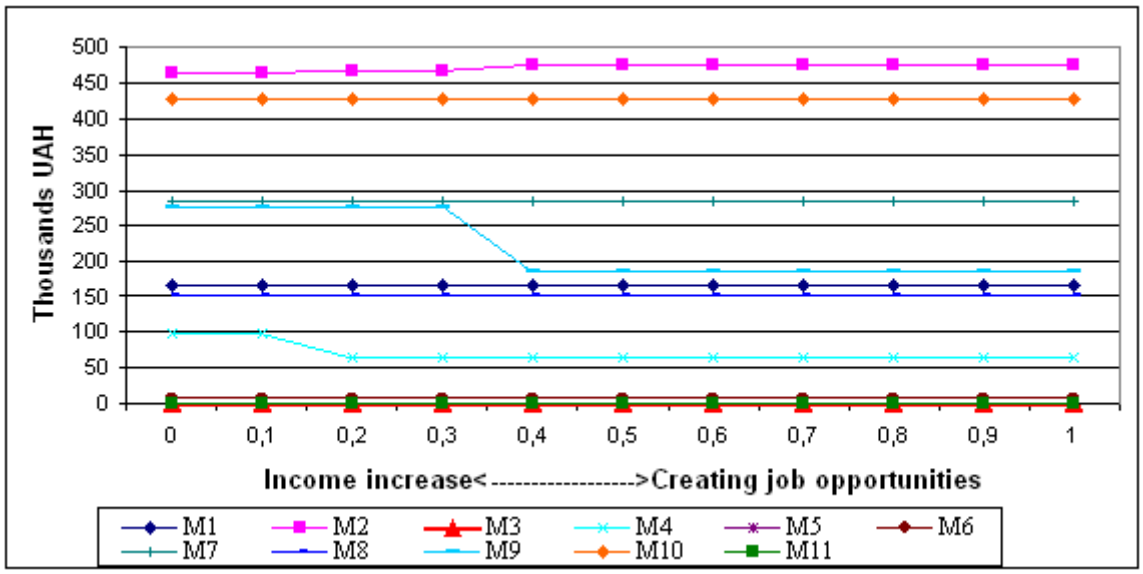


* The real amount of measure 2 is divided by 10 in the second chart of figure 7.
Source: Own compilation and calculations.

The production subsidy measure (M2), which comprised by far the largest part (74%) of Zdolbuniv agricultural budget in 2008, still is enhanced by 6% in computed optimum. This is despite the fact that this measure belongs to the "yellow box" group. At the same time, the second measure (M8), which has also a positive difference comparing to the reference situation, is focused on investment support of farm enterprises and is a "green" measure. However, it constituted only 2% of the reference budget. Further, it should be noticed that the amounts of second and third biggest financed measure (9% and 6% of the budget respectively) on supporting hop growing development and reimbursement of the costs of domestically produced agricultural equipment (M10 and M7) should be decreased from the district perspective. Also, from the second chart of figure 7 it can be seen that the upper and lower bounds are binding for all measures, except one (M2).

The changes in the budget allocation, which might appear due to the different weights of the objectives, should be also considered in discussing an optimal budget allocation (ZIOLKOWSKA and KIRSCHKE 2006). Therefore, the weight for the second objective "income increase" was set gradually from zero to one while the weight of the first one "creating job opportunities" was set in the inverse sequence. Figure 8 depicts the results of this parameterization.

Figure 8. Trade-off between objective one and two*



* The real amount of measure 2 is divided by 10.
Source: Own compilation and calculations.

The calculated results show that different levels of importance of both objectives do not have any influence on the optimal allocation of eight measures (M1, M3, M5, M6, M7, M8, 10 and M11). The growing importance of the second objective "income increase" leads to the negative shift of allocation of measures M4 and M9, both of which are related with the subsidies on credit interest rates. At the same time, the growing importance of the same objective leads to the positive shift of allocation of only production subsidy measure (M2), which is directly related to the income enhancement. According to these results it can be stated that there is slight trade-off between the two objectives and most of the measures similarly contribute to reaching both of them.

As the result of programming application, the overall value of the aggregated objective function increases from 38663,3 to 39130,9. Such an increase of 1,1% shows that the optimization potential is not large. The hypothesis was made that the model optimization potential is mainly restricted by 20% upper and lower bounds, which were used. Therefore, it was decided to test the optimization potential under not so restricted upper and lower bounds borders. After increasing the UB from 20% to 100%, setting the LB at zero and testing the model, the aggregated objective function increases by 5,2% comparing wit the reference situation. Hence, in order to get the bigger value of the objective function the greater "fluctuations" within the agricultural budget should be allowed by the regional state agricultural department.

Since the agricultural budget amounts have been seriously fluctuating during recent years (fig. 1), it was decided to test the model optimization potential also in the conditions of low agricultural support. In 2009 Zdolbuniv agricultural budget comprised only 1.6 mio. UAH, that was almost four times less then in the previous year. Based on the same experts' judgments the aggregated objective function increased from 19833,8 to 21892,6 (growth of 10,4%), comparing the optimal with reference situation, after the application of programming to 2009 case. Therefore, in the conditions of scarce budgetary resources, the optimization potential of the model is even enhanced.

7 POTENTIALS AND LIMITATIONS OF THE MODELING APPROACH

It is suggested that the presenting modeling approach could be used by the district agricultural experts as one of the methods to prove the need and scale of agricultural budget redistribution. However, before applying it in practice, it is useful to discuss what its advantages are and which shortcomings could be improved.

The two objectives chosen for the modeling in the presented case have proved to be highly interrelated and, perhaps, might not be regarded as the most suitable ones for the modeling. However, when a discussion issue is the redistribution of states funds, it is necessary to use the policy objectives determined in the normative documents. Whether these officially defined objectives are relevant could be the question of another separate research. Furthermore, it would be almost impossible to prove that the budgetary resources need to be spent in order to reach the objective introduced by the district agricultural department.

With respect to the selection of measures, the approach is straightforward. The measures, the financing of which is foreseen in the budget, are chosen. The same is with regard to constrains. They are just based on the existing legislative norms and agricultural possibilities of the district. It is also an advantage that the LP approach can be simply implemented in MS-Excel and all the necessary quantitative information for the definition of constrains is available at the district agricultural department.

On the other hand, 'the generation of impact parameters might be one of the most controversial subjects with regard to the model definition' (SCHMID et al. 2010: 35). First of all, district agricultural experts might be regarded as not completely independent experts (c.f. SCHMID et al. 2010). And in order to get worthy results it is very important that experts are able to put 'their professional ethics above the common desire to promote personal gain' (JONES 2002: 161). However, the obligations of the public servants are to be professional, competent and honest, devotedly serve people, etc. (VRU 1993, article 3). Furthermore, in Ukraine public servants are not allowed to be engaged in any kind of business activity or own, e.g., agricultural enterprises (VRU 1993). Therefore, they are not expected to have any personal interest in agricultural support redistribution and their judgments might be considered as appropriate ones.

To derive the objectives' coefficients for the presented model the impacts were evaluated by the experts during interviews. Then, the geometric means of these impacts were calculated. Such a "simple" assessment procedure was applied because of the time restrictions, because the surveyed experts had time only for one interview due to very busy working schedules. In perfect case, the impact evaluation procedure should be based on the idea of finding consensus between the experts of district agricultural department instead of calculating means. For this purpose multi-round Delphi-type approach is widely used in the research (TUROFF and LINSTONE 2002). The Delphi approach consists of several rounds. During the first round the experts make their judgements anonymously. Then, they receive from the facilitator the average results of the first round and are encouraged to revise their earlier answers. This procedure continues until the pre-defined criterion is reached (e.g. evaluation results do not change any longer). It is also possible to organise a joint seminar after the first or second round and tried to reach consensus in the group discussion.

As an alternative, it is also possible to use for the generation of impact parameters Analytical Hierarchy Process (AHP) methodical approach introduced by SAATY (1990). This method is based on measurement through pairwise comparisons and relies on the judgments of experts to derive a priority scale. Its advantage is that the results can be proved for their consistency with the Consistency Ration Index. This provides the scholar with the bigger confidence about the validity of his research. However, when it is necessary to compare pairwise more than ten measures (as in the presented model), it might become quite time-consuming for the experts to evaluate and compute the final results. Furthermore, to receive the very precise results by applying AHP it is recommended to use the special software which has to be bought additionally.

Nevertheless, the applied modelling approach reflects the experts' opinions on how the budget should be redistributed. It shows also the directions of such changes. Hence, it is proposed that the

district experts can use the presented modelling approach as one of the possibilities to confirm the necessity of changes in agricultural budget allocation. Of course, the model has to be continuously adjusted to the changes in the agricultural policy sphere, e.g., additional constrains might appear. However, despite the above-mentioned remarks, the modelling approach might be already used as a starting point in the process of making agricultural budget distribution more objective-oriented.

8 CONCLUSIONS AND OUTLOOK

There are various measures and programs with the help of which the state is able to support agriculture. However, not all of them suit to the specific agricultural features of each country. Therefore, the relevant ones need to be thoroughly chosen for the implementation in each specific case in order to fulfill the set agricultural objectives and receive the maximum benefit from the use of state monetary resources. Furthermore, before deciding on relevant measures, it is important that the relevant objectives of the agricultural policy have been formulated. The undertaken agrarian policy has to correspond both to the domestic needs and international obligations of the country.

With respect to the first objective concerning agricultural budgeting in Ukraine, the following statements can be summarized. First of all, the agricultural budget is very "unpredictable" in a way that the amounts of specific measures financed might change every year. This happens partly due to the absence of the adopted medium-term scheme of agricultural support in Ukraine and, as a result, the budget allocation is changed every year. The mechanism of deciding on the measures that are going to be financed in the next year is not transparent. A number of support programmes might also change every year and the agricultural producers are not informed about such alternations in advance. Local state agricultural officials are not engaged in the process of agricultural budget formation and are not familiar with the principles and purposes by which the distribution of agricultural support is decided.

According to the second objective of this paper, a model for calculating an agricultural budget allocation was developed. The proposed modeling approach enables to integrate the local agricultural experts in the decision-making process concerning agricultural funds distribution. It is recommended to use this model with the purpose of supporting the agricultural decision-makers in their initiatives to make agricultural budget distribution more objective-oriented, at least on the district level. Although the results from the used modeling approach heavily depends on the experts' individual attitudes towards the necessary changes in the development of agricultural support, the modeling outcomes do show how the agricultural budget should be redistributed to achieve the optimum. It is also proved that the set agricultural objectives are highly-interrelated. Furthermore, the proposed approach demonstrates bigger optimization potential in the conditions of scarce financial resources which is the actual situation in the sphere of agricultural support in Ukraine.

The results of the present research work raise a range of questions which remain to be thoroughly examined in the future. First, the agricultural policy framework need to be further analyzed in order to develop proposals on specific objectives for the separate measures or group of related measures. These objectives need to be relevant, accurate and valid. Second, LP approach could be used in order to model distribution of agricultural funds on the regional level. At the regional agricultural department level a lot of decisions, concerning the distribution of agricultural monetary resources, are made. Therefore, the modeling of regional agricultural budget allocation might facilitate the officials in finding out its "optimum" distribution.

Thus, the results of this paper contribute to the scientific field focused on analyzing the possibilities of making agricultural support more objective-oriented and highlight the related issues which need to be further investigated in the future.

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