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SOME OF THE FINANCIAL ASPECTS OF AGRICULTURAL POLICY IN THE CONTEXT OF THE FARM EFFICIENCY IN THE REPUBLIC OF MOLDOVA

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Abstract

This paper analyses the subsidies allocation in the agricultural sector of the Republic of Moldova and the impact of subsidies on agricultural outputs and profits. The methodology is based on Data Envelopment Analysis in order to define and calculate technical efficiency for each corporate farm. The empirical application is made on 451 Moldovan farms. Three main hypotheses where tested concerning accumulation of current assets and absorption of subsidies by farms with different degrees of technical efficiency. In this case, the farms with lower overall efficiency are more sensitive to the state support and are able to absorb larger amount of subsidies. Regression analysis was used to provide a framework for studying the implemented policy reflected by the data in use.

Keywords**:** *agricultural sector, technical efficiency, subsidies allocation, Republic of Moldova*

INTRODUCTION

In the past century the history of Moldova experienced a lot of ups and downs. In 1918 the supreme authority of the Moldovan state decided to unite with Romania. This unity lasted till 1940, the year when the country was annexed by the Soviet Union. Moldova functioned as a territorial entity within the USSR until the last decade of the XX-th century. In all this time, Moldova remained a predominantly an agricultural state. But Stalin's campaign of forced collectivization after the World War II was a major factor explaining poor performance of agriculture and highly inefficient forms of organization. This situation perpetuated until the break-down of the Soviet Union.

Since 1991, the year when Moldova became independent and sovereign, together with other former soviet republics, Moldova has implemented a wide range of radical reforms affecting its social and economic system. Given the importance of agriculture in the Moldovan economy, agrarian reform has formed a particularly important part of the reform process overall. With agriculture contributing 25% of GDP and accounting for an average of 45% of employment between 1996 and 2003, Moldova is still an agrarian country—much more so than Russia or Ukraine, where the share of agriculture in recent years is below 10% in GDP and 20% in employment. It is even more agrarian than its western neighbour Romania, where the share of agriculture has dropped to 13% in GDP and 35% in employment. In terms of its agrarian characteristics, Moldova is close to Transcaucasia and Central Asia, where the share of agriculture exceeds 20% in GDP and 40% in employment.

One of the ways to reform agriculture and make it more efficient was the state support for people involved in agriculture. It is still a widely spread practice in Moldova and in other countries. This support is particularly important in countries with transition economies, like Moldova. Many scientists and politicians believe that the market can cause harm to agriculture and food supply if there is no state intervention and the market regulates itself. The reasons for this are: the high risk of the agricultural production, the long production period, the difficult access to loans and the large demand for assets in turn-over. The same scientist believe that when the state support is missing, the farmers might over-use the land and the natural resources, cause harm to the environment, not be able to meet the quality standards and in some periods even leave many of them at the edge of hunger [6].

On the other hand, the state financial support creates problems. It reduces the capability of the market to auto-regulate and allocate resources

optimally. This is done by creating unequal conditions for participants in the agricultural markets. Also, big financial resources involved, led to corruption, bribes and abuse of governmental power. Finally, an important burden of taxes both on citizens and businesses is created in order to provide the financial resources for the state support in agriculture.

MATERIAL AND METHOD

The methodology presented in the paper allows testing some wide spread hypotheses about the state support for Moldovan corporate farms, namely:

- Accumulation of current assets is a primary direction of state support.
- The subsidies are more efficient when received by relatively efficient farms.
- The relatively inefficient farms can efficiently absorb larger amount of subsidies than the farms that achieve higher efficiency.

Modern efficiency measurement begins with Farrel [4], who defined a simple measure of firm efficiency which could account for multiple inputs. He proposed that the efficiency of a firm consists of two elements*: technical efficiency*, which reflects the ability of a firm to obtain a maximal output from a given set of inputs, and *allocative efficiency*, which reflects the ability of a firm to use the inputs in optimal proportions, given their respective prices. These two measures are then combined to provide a measure of total *economic efficiency* [2].

As these notions might not be known by the readers, hereby I present a simple example in order to illustrate graphically and theoretically these notions. We suppose to have two firms with two inputs x_1 and x_2 that produce a single output, y assuming constant returns to scale. This assumption provides us with the idea that the production function is linear with input as the argument. Also, the constant returns to scale assumption allow us to represent the technology frontier as a unit isoquant SS', as shown in Figure 1. Another important fact is that the production function of a fully efficient firm is not known in practice, and thus it is estimated from observations on a sample of firms in the industry concerned, in our case corporate farms.

In the figure 1, precisely the isoquant of the fully efficient firm, represented by SS', is the measure of technical efficiency. If a given firm uses quantities of inputs, defined by the point P, to produce a unit of output, the technical inefficiency of the firm could be represented by the distance QP, which is the amount by which all inputs could be proportionally reduced without the reduction of output. This is usually expressed in percentage terms by the ratio QP/OP, which represents the percentage by which all inputs could be reduced.

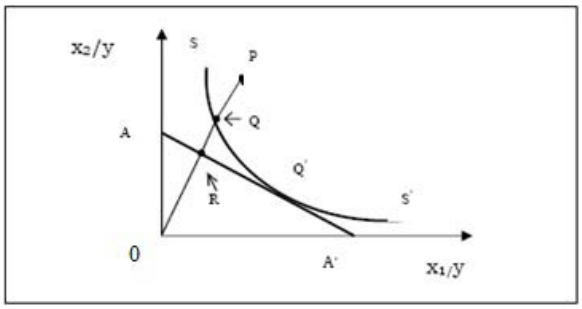

Figure 1: Technical and allocative efficiencies.

The technical efficiency (TE) in a firm is most commonly measured by the ratio:

$$TE=OQ/OP$$

which is equal to 1 minus QP/OP.? It will take a value between 0 and 1, and hence provide an indicator of the degree of technical inefficiency of the firm. If the ratio TE is equal to 1, this indicates that the firm is fully technical efficient according to the sample evaluated. For example, the point Q is technically efficient because it lies on the efficient isoquant.

If the input price ratio, represented by line AA' in Figure 1, is also known, allocative efficiency may also be calculated. The allocative efficiency (AE) of the firm operating at P is defined by the ratio

$$AE=OR/OQ$$

with the distance RQ representing the reduction in production costs that would occur if production were to occur at the allocatively, also technically, efficient point Q', instead of at

the technically efficient, but allocatively inefficient point Q.

The total economic efficiency is defined by the ratio:

$$EE=OR/OP$$

where the distance RP is interpreted in terms of cost reduction. An interesting property of the total economic efficiency is that it is the product of TE and AE, as shown below:

$$TExAE=(OQ/OP)x(OR/OQ)=OR/OP=EE$$

As, we mentioned before, it is important to notice that all three measures are bounded by zero and one [3].

In order to apply this useful model in the data we obtained, we had to exclude the calculations of the allocative efficiency and concentrate only on the technical efficiency. The reason for this restrictive measure is the absence of prices of inputs and outputs in the data. In order to properly calculate technical efficiency, we used a method called Data Envelopment Analysis (DEA) [1].

RESULTS AND DISCUSSIONS

The main result that this paper aims to acquire is the idea that the subsidies system and the allocation have an important role in raising the economical efficiency of Moldovan corporate farms. The reality shows that due to the low productivities of these farms and chain organizational problems, they are very dependent to this system. It is very important to see if the two hypotheses stated at the end of the introduction part are supported by our data.

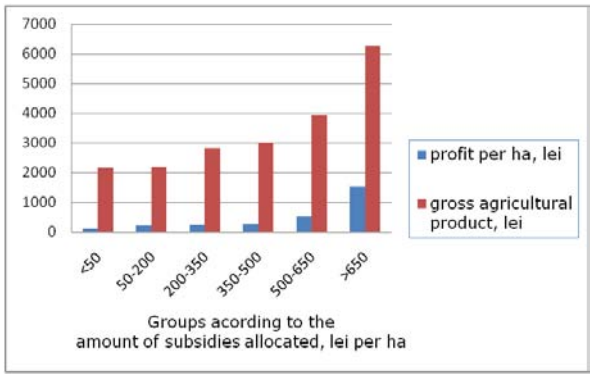

Figure 2: The impact of the amount of subsidies on the indicators of production.

The first indicators were obtained by grouping the corporate farms according to the amount of subsidies allocated, as shown in Figure 2. Analyzing the presented data, the most important conclusion is that there is a direct positive correlation between the amount of subsidies and the gross agricultural product, hence also with the profit. It is noticeable that the lowest amount of subsidies belongs to farms from the first group. For the next groups, with subsidies from 50 to 650 lei per ha, we observe a continuous rise in profits until 530 lei per ha. The impact of subsidies is even more striking when speaking about the last group, with more than 650 lei per ha. We observe good economic results with profits at 1522 lei per ha. Thus, this figure provides us the assumption that is more efficient to allocate subsidies to farms that are carrying out a stable economic and financial activity. Nothing is new in this sense, but the main challenge is to find the corporate farms which are not in the top category, but are able to absorb subsidies and have a steadily increase in productivity, profitability and efficiency.

Table 2. Amount and distribution of subsidies depending on the rate of their efficiency

		Technical efficiency				
N	Inputs	100 %	75%	50%	25%	0%
1	Sum of retributions for workers, %	32.2	30.54	21.61	21.7	27.4
2	Fertilizers,%	6.03	9.59	12.34	6.4	5.22
3	Diesel, gasoline and other oil related products,%	14.8	16.75	15.85	14.96	13.2
4	Rent paid for land and other fixed assets used, %	9.91	8.9	10.31	11.31	5.85
5	Other indirect expenditures and costs,%	10	2.89	4.68	5.87	6.57
6	Numbers of tractors and other agricultural devices, %	26.9	31.32	35.2	39.76	41.7
Total subsidies , million lei		35,1	27,9	46,1	34,1	4,66
Share of subsidies, %		23.7	18.87	31.11	23.08	3.15

In our investigation, an important assumption is that the rate of efficiency of state support should be equal for all farms and all directions. Therefore, we test 5 ad-hoc levels

of efficiency: 100%, which relates to a scarce budget financing, 75%, 50%, 25% and 0%. The complete framework is expected to approach the Pareto optima set in the space of amount and efficiency of subsidies so as to let the decision factors make the choice [5].

A surprising fact is that the farms with the lowest efficiency, from 0-25%, receive only a very small share of 3.15% of subsidies, and in this way their road towards efficiency and success is very rough. One of the main causes for this fact is the lack of managerial skills and competence in the low efficiency farm, and so the State oriented its efforts towards the farms with potential and perspective. In this sense, analyzing the data, there are 32.8% of farms from the sample with a technical efficiency lower than 0.25, and receive only the small share of subsidies presented above (3.15%). One the other hand, if we count the number of corporate farms with technical efficiency equal to 1 (100% in our table), we get only 6.8% of the total number of farms, that get nearly one quarter of the total subsidies allocated in Moldova (23.79% in our table).

The method of analyzing the common features of technical efficiency and subsidies allocation is Regression Analysis. Regression analyzes the relationship of a dependent variable and one or more independent variables. The effect of causality can lead to some very misleading results, as the author observed when analyzing the data. First attempt was to make subsidies as an independent variable, and technical efficiency as the dependent one. As the results turned out to be inconclusive, the relation was turned on the other way around. The new results were of a much better shape and are presented below.

An important remark is to be made about the type of regression function. As the linear model proved to be rather ambiguous, with inconclusive Fisher test and with predictions different from reality, the author decided to use a polynomial regression function with the rank two.

The first important thing to be mentioned that the R-squared statistic, with indicates that the model as fitted explains the data, is 4.41%. The adjuster R-square statistic, with is more useful when comparing with other models, is 3.97%. Secondly, The Durbin-Watson statistic, that tests the presence of autocorrelation, has the value 1.99147 (very close to 2) and a p-value greater than 0.05, thus proving the absence of autocorrelation. Thirdly, an important remark is to be made about the p-value of the highest order term of the polynomial. Its value is 0.000712 and is obviously much less than 0.05. In this way, the author considered that it is not necessary to consider any model of lower order.

Finally, according to the conclusive result of the F-test and of statistical significance of all coefficients we can write the equation that fits our model:

$$\textbf{\textit{Subsidies} = 0.941-2.033*TE+2.979*TE}^2$$

We can draw a graph of this model in order to present and better discuss the results of our regression. It is presented in Figure 3. The pattern observed is indeed a non-linear one. As the values of technical efficiency are between 0 and 1, the graph presents the entire space of possible values of our model.

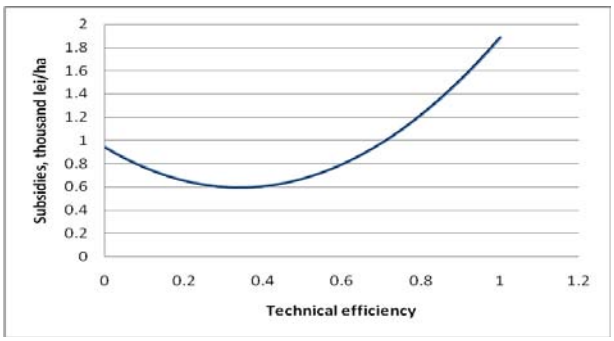

Figure 3: Relation between the subsidies and technical efficiency

The pattern presented is surely rather surprising for the reader, as it was for the author. Apparently, the distribution function is not monotonic on entire interval as it decreases until TE is 3.8 and the steadily increases until TE reaches its maximum value, one. In this way, we observe that in the Republic of Moldova, theoretically, a corporate farm might increase its technical efficiency and sequentially receive fewer subsidies from the state. The farms that have a technical efficiency that is lower than 3.8

have to struggle with this unfair paradox. This is another result that ought to be remembered by policy makers in the future. In order to have a fair access to subsidies for everyone, the curve should be monotone on the entire interval, and always increasing. In this way, any firm has guaranteed a larger amount of subsidies for an increase in technical efficiency. Also, as we can see from the equation the coefficient that corresponds to the variable of a higher order has a plus sign. This means that as the technical efficiency approaches to 100%, the growth in amount of subsidies increases "faster". Therefore, hopefully all corporate farms will try to converge to this point where the subsidies have their maximum value.

The following discussion will focus on the actual policy of the Agency of Interventions and Payments in Agriculture when it comes to subsidies distribution in 2010, the year of its creation [7]. Some of the most relevant reforms where the following:

-Crediting stimulation of agricultural producers by the commercial banks. This measure comes to stimulate the crediting system in the agricultural sector, in the conditions of economic crisis and high value of financial resources available in the market of Moldova. The maximal value of rendered assistance to a single beneficiary does not exceed 85 million lei.

-Mechanism stimulation of risks insurance in agriculture. This measure supposes development advancement of the risks insurance system in agriculture. The financial assets provided in this section will be used in conformity with the Government decisions and with the statute of the Agency. A list of risks was developed and implemented.

-Attracting foreign investment for stimulation of acquisition of techniques, agricultural equipment and irrigation equipment. The main partners are European Bank for Reconstruction and Development, World Bank and European Union. The value of the rendered help is set under the form of compensation in percentage rates of the proportion of 30% from the cost of techniques and irrigation equipment, but will not exceed the total amount of 250 thousand lei for every beneficiary.

- Sustaining of ecological agriculture advancement and development. It pursues the object of efficient using of natural resources and environment protection by developing the ecological agricultural sector. The value of the rendered help is calculated under the form of dimensions expressed as set amounts to the measure unit and constitutes 700 lei for one hectare of the ground area subjected to the conversion process in the first year and 400 lei for the second year. An additional 20% of the price of the ecological agricultural and food products is returned to the producer. The maximum value of the rendered support for a beneficiary is 100 thousand lei.
- Implementation of a national program for sustaining vegetables production on a closed ground (winter hothouses and solaria). The value of the rendered help is calculated under the form of compensation in percentage rates in the proportion of 30% from the cost of the hothouse modules, on the acquired equipment and outfit that are necessary for vegetables production on the closed ground. The maximum value of help for every beneficiary is 100 thousand lei.

All these measures are complementary to the direct investment and distribution of subsidies. The recent reforms and new directions drawn by the Agency prove that funds concentration into a single organ raises the efficiency of their managing.

CONCLUSIONS

In order to draw proper conclusions of the final paper, we must state the obvious truth that priority for granting subsidies should be for those farmers that are carrying out a stable economic activity and improve their financial situation from beneficiating of subsidies, thus contributing to the improvement the whole branch economic situation. In this final paper, we tried to connect the subsidies distribution with one of the most important characteristics of each corporate farm, the technical efficiency. We tried to prove that subsidies are very important for the development of the

agricultural sector, but also check if the system of distribution creates incentives for efficient farms activity.

The core of the methodology used was the Data Envelopment Analysis in order to calculate the technical efficiency, in this way creating new characteristic for each corporate farm. On this basis, the evaluation focused on the connection between the farm's efficiency and the production factors, the profits obtained and the category of subventions.

It is very important to briefly evaluate the initial hypotheses presented in the introduction. The first hypothesis supposes that the current assets should be the dominating destination for the state funding. As we studied in Table 2, it is strongly supported by our data with more or less ¾ of the funds targeted towards currents assets for all the farms, irrespective of their efficiency.

The second hypothesis about the higher efficiency of state financing on relatively efficient farms is supported by a limited number of cases. Here we remember the result that we obtained that stated the fact that the total production of farms with technical efficiency equal to 50-75% is not influenced by the presence or absence of the subsidies. Additionally we obtained numbers that are completely opposite to the hypothesis, as for farms with 100% technical efficiency that produce milk. These results suggest that additional studying on different sets of data should be executed by the decision factors.

The third hypothesis is the positive correlation between the inefficiency and the amount of state financial support that can be efficiently absorbed. This hypothesis is generally supported by the data as we see in Table 5. Indeed, the low efficiency firms have a higher rate of subsidy absorption, but unfortunately the absolute amount of subsidies is rather low.

Finally, with respect to the allocation of subsidies, the two basic results obtained were the arguments in favour of targeting subsidies and financing current assets prior to the fixed assets. While the second result is sustained by the existing policy, the first one suggests correctives of current policies.

Using these hypotheses, the author tried to study some aspects of the reality using a model that provides only limited amount of data. However, the important results obtained and presented can be rather useful for decision factors, policy makers and further studies about subsidies allocation. The methodology used is not necessary limited to Moldovan case, as many of the ex-Soviet state share roughly the same agricultural characteristics.

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REFERENCES

[1] Charnes, A., Cooper, W.W., Lewin, A.Y. and Seiford, L.M. 1995. Data Envelopment Analysis: Theory, methodology and applications, Kluwer Academic Publishers, Boston

[2] Coelli, T., Rao, D.S.P. and Battese, G. 2005. An Introduction to Efficiency and Productivity Analysis, Kluwer Academic Publishers, Boston

[3] Coelli, T., 1996. A guide to DEAP version 2.1: A Data Envelopment Analysis Program, CEPA Working Paper 96/08, Deparment of Econometrics, University of New England, Armidale

[4] Farrell, M.J. 1957. The measurement of productive efficiency. Journal of the Royal Statistical Society, Series A, 120: 253-281

[5] Lerman, Z.(2008) Russia's agriculture in transition: Factor markets and constrains of growth, Lexington books, Plymouth.

[6] Newbold, P., Carlson, W.L. and Thorne, B.M. 2007. Statistics for business and economics, Prentice Hall, Upper Saddle River, N.J.

[7] Sarris, A., Doucha, T., Mathijs, E. 1999. Agricultural Restructuring in Central and Eastern Europe: Implications for Restructuring and Rural Development. European Review of Agricultural Economics, 26: 305-330