ANALYSIS AND CONTROL OF GOVERNMENT SUBSIDIES FOR INVESTMENTS IN AGRICULTURE OF THE RUSSIAN FEDERATION

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ABSTRACT

Subsidies are an important part of development of agriculture in Russia. The vast majority of agricultural holdings have negative profit margin without government support. Comparing an amount of government support in Poland and in Russia, it was equal to 76.21 m PLN for 1,000 km^2 of agricultural land in Poland versus 6.35 m PLN in Russia in 2014. Such situation leads to low productiveness of agriculture in Russia. As Russian agriculture is extensive, the Government has made a decision to assign about 40% of the support amount to recover rate of investment loans intended for development of material and technical facilities of agriculture. This program is not popular and it involves 3.55% of the total number of agricultural holdings only. In order to estimate efficiency of utilization of subsidies a cluster analysis was made by means of K-mean method. It revealed 3 clusters depending on efficiency of subsidies utilization. Some control procedures are suggested to manage efficiency of utilization of government support.

Key words: Russian agriculture, government support, efficiency of support for agriculture, cluster analysis

INTRODUCTION

Well-developed agriculture is a foundation of prosperity of the country and good health condition of its population. Russia is situated in 4 climate zones (arctic, subarctic, moderate and tropical) and the biggest part of its lands is in risk agriculture area. Under such area conditions agricultural production is quite complicated task without government support.

Having specific activity, agriculture is not able to function steadily and continuously without government's interference [Kolosova 2016]. Being quite complicated, government's regulation of the agricultural sector simultaneously influences profit of agricultural manufacturers, social structure of rural area, market and environment support [Borniakov 2011]. The review of regulation methods is presented on Figure 1.

The government increases profit of agricultural manufacturer without impact on prices of products that is direct support.

Indirect support provides regulation of internal prices of products, loans at preferential rates, share of imported products in import and export and customs duties.

Government support of investments (according to the report of Ministry of Agriculture) is performed by subsidizing of interest rates of loans in such priority areas as vegetable growing, flour-milling and baking industry, vine growing etc. Investment support helps renew production facilities and establish new ones. Consequently, it may be concluded that government support of agricultural holdings is highly important for the whole population of the country.
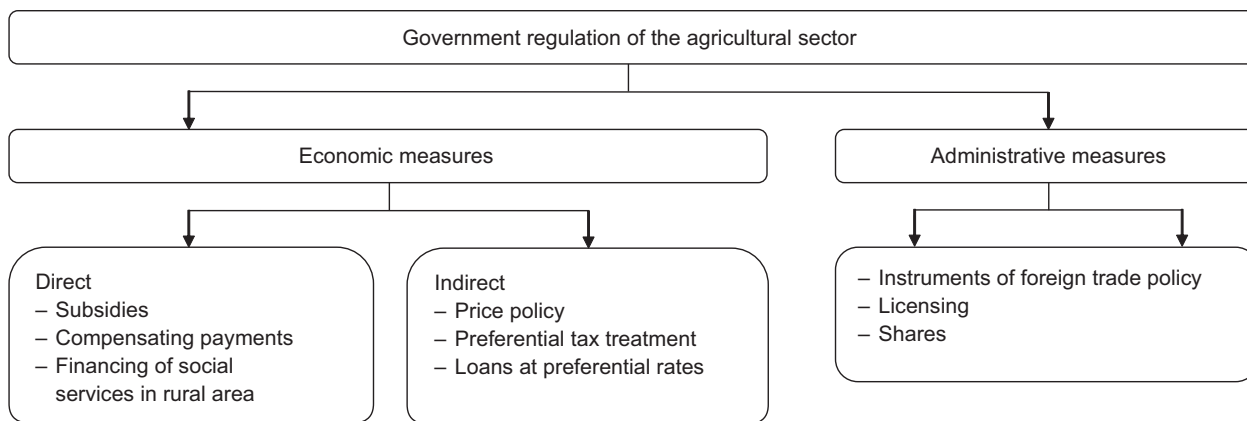
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┌─────────────────────────────────────────────────────────────────────────┐
│             Government regulation of the agricultural sector               │
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| Economic measures | | Administrative measures |

| Direct
– Subsidies
– Compensating payments
– Financing of social
  services in rural area | Indirect
– Price policy
– Preferential tax treatment
– Loans at preferential rates | – Instruments of foreign trade policy
– Licensing
– Shares |

Fig. 1. Measures of government regulation of the agricultural sector
Source: Own elaboration.

However, the investigation [Webb and Block 2010] provides reverse point of view. Developed countries such as the USA, Canada and Germany have excellent support of agriculture but in order to get high profit, agriculture is focused on production of cheap products such as corn syrup instead of fruits etc. It influences health of final customer negatively.

The aim of the research: to estimate the current status of government support by investment subsidies in agriculture and estimate efficiency of these subsidies in different regions of the Russian Federation.

The objectives of the research are:
1. Analysis of the current condition of government support of agriculture.
2. Making cluster analysis by grouping all regions of the Russian Federation depending on efficiency of government support investments.
3. Analysis of control procedures for government support.

MATERIAL AND METHODS

The number of investigated regions of the Russian Federation is 85 (79 regions of them are chosen). Initial data was taken from the website Statistics of Russia and the website of Ministry of Agriculture of the Russian Federation. The data set outlines were deleted in order to obtain reliable result during analysis of statistical data. Calculations were done by means of software STATA 13. During cluster analysis all regions of the Russian Federation were divided into 3 clusters depending on efficiency of subsidies utilization. The method, used for clustering, was K-means.

K-means cluster analysis and its variant, k-medians cluster analysis, are discussed in most cluster analysis books [Makles 2012]. K-means and k-medians clustering are iterative procedures that partition the data into k groups or clusters. The procedure begins with k initial group centers. Observations are assigned to the group with the closest center. The mean or median of the observations assigned to each of the groups is computed, and the process is repeated. These steps continue until all observations remain in the same group from the previous iteration.

Lance and Williams [1967] developed a recurrence formula that defines, as special cases, most of the well--known hierarchical clustering methods. From the notation of Everitt et al. [2011], the Lance and Williams recurrence formula is as follows:

$$d_{k(i,j)} = \alpha_i d_{ki} + \alpha_j d_{ki} + \beta d_{ij} + \gamma \mid d_{ki} - d_{ki} \mid$$

where: d_{ij} – the distance (or dissimilarity) between cluster i and cluster j;

$d_{k(ij)}$ – the distance (or dissimilarity) between cluster k and the new cluster formed by joining clusters i and j;

α_i, α_j and β and γ – parameters that are set based on the particular hierarchical cluster-analysis method.

Government support conditions

To estimate conditions of government support of agriculture it is necessary to compare Russia with other countries by means of a comparison analysis providing clear vision on this matter.

Table 1 presents comparison of key factors identifying current condition of agriculture in Poland and in the Russian Federation. Percentage of agricultural land in total country square in Poland is 69.75% from the total area of the country. In Russia, it is only 11.17%. Cow population in Russia is 3.3 times more than in Poland. Grain crop is 5.13 times more in Russia, too. Nevertheless, intensity of agriculture in Poland is much higher than in Russia, for instance, crop capacity of grain is twice higher.

This high level result in Poland is expected because of big value of subsidies equal to 76.21 m PLN for 1,000 km² of agricultural land versus 6.35 m PLN in Russia. For the reason of low amount of subsidies, agriculture in Russia implements traditional extensive approach demanding less money and providing worse result.

Table 1. Estimation of current condition of agriculture Poland and the Russian Federation in 2014

Definitions	Poland	Russia
Total country square (thous. km²)	312.68	17 125.19
Square of agricultural land (thous. km²)	186.83	1 912.86
Agricultural land in total country square (%)	59.75	11.17
Cattle (thous. head)	5 920	19 564
Milk whole fresh cow (thous. t)	12 933	30 791
Cow milk yield (kg)	5 298	4 841
Wheat (thous. t)	11 629	59 711
Wheat yield [dt·ha⁻¹]	49.721	24.976
Total amount of subsidies in the agricultural sector (bn PLN)	14.24	12.15

Source: Own elaboration based on the data from Faostat, Rosstat (www.minrol.gov.pl).

There is the only one program of government support of agriculture in the Russian Federation, i.e. "Government program of agriculture development and regulation of markets of agricultural products, raw materials and food".

The amounts of money appropriated to agriculture per year since 2008 is on Figure 2. It should be taken into account that exchange value of ruble fell down that resulted in inflation growth and partly depreciated provided money.
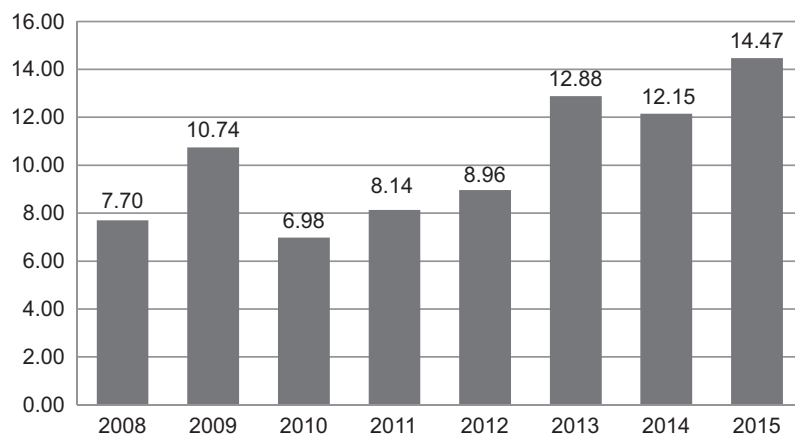
Fig. 2. Subsidy assistance dynamics in agriculture of the Russian Federation in 2008–2015 (1,000 m PLN)

Source: Own elaboration based on Report of Russian Federation Ministry of Agriculture (http://www.mcx.ru/).

As Russian agriculture is extensive, the Government has made a decision to assign about 40% of the support amount to recover rate of investment loans intended for development of material and technical facilities of agriculture. Content of agriculture development program is presented in Table 2. The highest priority for investments obviously belongs to animal breeding.

Table 2. Content of agriculture development program in 2014

Definitions	Total amount of subsidies		Investment interest rate of subsidies	
	(m PLN)	(%)	(m PLN)	(%)
Total	12 147.03	100	4 544.24	100
Plant cultivation development	3 734.64	30.75	1 334.56	29.37
Cattle breeding development	4 654.85	38.32	3 209.45	70.63
Steady development of rural area	1 609.98	13.25	–	–
Land improvement	662.5	5.45	–	–
Technical and technological modernization	526.87	4.34	–	–
Minor business forms support	353.13	2.91	–	–
Regulation of agricultural products and food and raw material markets	102.21	0.84	–	–

Source: Own elaboration based on Report of Russian Federation Ministry of Agriculture (http://www.mcx.ru/).

According to the statements of program of government subsidies for investments any agricultural holding or a private farm is able to take part in the program at one time and get recovery of interest rate of loan intended for development of material and technical facilities. However, number of holdings involved in this program is quite small. According to the Report of Russian Federation Ministry of Agriculture, estimation of investment projects utilization in agriculture is the following: number of agricultural entities 248 569 pcs,

number of existing loan investment projects 8,827 pcs. In this case only 3.55% of entities were involved in the program in 2014.

Low popularity of this program is caused by a complex reason involving filling heaps of documents, low awareness of agricultural holdings managers of opportunity of getting government support, high interest rate on loans provided by banks, high inflation and fluctuation of holdings about future government policy.

Table 3 aggregates banks supporting investment loan program for agricultural holdings in Russia. Banks provide loans to agricultural holdings unwillingly especially investment loans for the reason of high risks, seasonal production and low liquidity of underlying assets.

According to the data, common proportion of both Rosselkhozbank (43%) and Sberbank (26%) is about 70% of the total amount of provided subsidies.

Table 3. Investment projects in agriculture in banks in 2014

Name of bank	Number of loan agreements (pcs)	Value of loan agreements (m PLN)
Total	8 827	26 922
Rosselkhozbank	5 223	11 498
Sberbank Rossii	2 595	6 898
Alpha-Bank	77	3 194
Gasprombank	19	404
Vnesheconombank	4	622
Others	909	4 306

Source: Own elaboration based on Report of Russian Federation Ministry of Agriculture (http://www.mcx.ru/).

Investment loans in Rosselkhozbank are provided under the following conditions: projects with interest rate subsidies are considered with higher priority. It is Ministry of Agriculture of the Russian Federation which takes decision to provide subsidies. Loan period is up to 15 years. Investment loan interest rate is 15–19%. The following areas are of high priority: construction, restoration, modernization, perennial plantings and vine land establishment, projects on import-substituting products, projects on agricultural areas' development.

CLUSTER ANALYSIS OF INVESTMENT SUBSIDIES

Estimation of efficiency of subsidies utilization is important part of support of agriculture by means of investment subsidies.

A cluster analysis was used for estimation of efficiency. An effect of provided subsidies was estimated by seven indexes. Regions with different climate and economic conditions and different amount of support were involved into analysis. Total subsidies per 1 ha of agricultural land is the key index for unification as some regions, especially situated to the North, have big actual area but small agricultural land.

The investigation involved 79 regions in 2014. They were divided into 3 clusters by means of the cluster analysis *k*-means and software STATA. The results are aggregated in Table 4.

Table 4. Variables for clusters analysis

Definitions	1 cluster	2 cluster	3 cluster
Total subsidies (PLN·ha⁻¹ agricultural land)	30.84	76.04	251.7
Amount of investment subsidies in the total amount of subsidies (%)	51.95	89.46	33.24
Ratio of investment subsidies to agricultural gross value product (%)	1.35	1.88	1.99
Agricultural gross value product (thous. PLN·ha⁻¹)	1.09	2.72	3.77
Gross regional product per inhabitant (thous. PLN)	15.06	16.07	30.25
Share of arable lands in total amount of agricultural lands (%)	56.08	65.04	59.07
Rural population share in the total population (%)	32.65	34.95	22.39

Source: Own study.

Table 5. Additional variables of regions divided into clusters

Definitions	1 cluster	2 cluster	3 cluster
Wheat yield (dt·ha⁻¹ of harvested acreage)	19.6	27.38	25.78
Milk yield (kg·cattle unit⁻¹)	3 962.73	4 555.24	5 042.05
Mineral fertilizer amount (equivalent to 100% of plant-food basis) (kg·ha⁻¹ crop of agricultural plants)	25.7	54.09	43.87
Organic manuring (t·ha⁻¹ of agricultural plants)	0.79	1.61	3.31
Profit margin of plant cultivation products (with subsidies from state budget) (%)	9.72	12.35	1.73
Profit margin of cattle breeding products (with subsidies from state budget) (%)	10.29	14.05	4.4
Feeds consumption (dt feed units·cattle unit⁻¹)	28.38	31.86	26.85
Monthly salary (PLN)	1 585.08	1 650.01	2 347.67
Profit margin of agricultural organizations without subsidies from state budget (%)	0.4	−6.45	−1.94
Profit margin of agricultural organizations with subsidies from state budget (%)	13.89	8.3	15.89
Ratio of arable land in total square region (%)	27.07	26.4	14.2

Source: Own study.

The regions were additionally estimated by some factors indicating intensity of agriculture that is wheat crop, milk yield, mineral fertilizer amount per 1 ha etc. and some financial factors (Profit margin with and without subsidies, monthly salary). The results are aggregated in Table 5.

The regions are divided into groups by amount of investments and intensity of its output. The cluster 1 is characterized by the smallest subsidies per 1 ha of agricultural land equal to 30.84 PLN and ratio of investment subsidies to agricultural gross value product equal to 1.35 %. The cluster 2 has 76.04 PLN of subsidies and ratio of investment 1.88%. The cluster 3 has 251.70 PLN of subsidies and ratio of investment 1.99%.

Ratio of investment subsidies to agricultural gross value product (%) indicates value of output (manufacturing of agricultural products) from investment support in monetary equivalent.

Additional indexes show the lowest amount of government support in the regions from the cluster 1 but at the same time only these regions have positive profit margin 0.4% without subsidies and 18.89% including subsidies. The cluster 3 having the biggest amount of government support has the highest profit margin 18.89%. However, estimations of physical indexes (wheat crop and mineral fertilizer amount) and earning power of holdings in terms of particular areas such as plant breeding and animal breeding point out that holdings from the cluster 2 are obviously leaders. It might be result of investments in particularly plant breeding and animal breeding as the amount of subsidies is the biggest one in this cluster.

Fig. 3. Localization of clusters in Russian Federation

Source: Own elaboration.

Clustering of regions is presented on the map of the Russian Federation (Fig. 3). Location of the regions on the map does not provide sufficient evidences to define the reasons of assignment of subsidies and efficient/inefficient utilization of investments. It is suggested that the assignment of subsidies has not only economic character but political as well.

CONTROL OF SUBSIDIES

Both distribution of government support and efficiency of its intended use should be controlled.

Methods and techniques of control are as following [Kontsevaya 2016]:

1. Preliminary control provides reasonable and legal presentation of facts belonging to operational activity of a holding.
2. Current control provides complete and valid presentation of operations. Current control is intended to avoid illegal operations in the holding's activity.
3. Follow-up control proves validity of presented facts. This control may be fulfilled by both internal departments of the holding and audit services of Ministry of Agriculture.

The methods and techniques such as check of documents, control of reasonable, legal and complete order of getting financial facilities, control of intended utilization of financial facilities, monitoring of financial and

business operations, check of reasonable and intended fulfillment of these operations, recalculation for checking mathematical accuracy, monitoring and inspection of business operations may be used to carry out preliminary, current and follow-up control. These control procedures may be fulfilled by both government services and internal departments of agricultural holdings.

CONCLUSIONS

1. Government support of agriculture in the Russian Federation is carried out in accordance with the document "Government program of agriculture development and regulation of markets of agricultural products, raw materials and food for 2013–2020". It defines the total amount of financial government support of agriculture. According to this program an annual amount of financial support is 14 bn PLN. This program has the following objectives: steady development of farm lands (drinking water and gas supply, provision of housing), soil fertility support, development of high priority segments of industry, and cattle breeding first of all, extension of cultivated area occupied with basic seeds, increasing of financial stability of agricultural organizations providing loans and recovering part of production costs, decreasing of risks by increasing insured cultivated areas, smoothing variance of prices and implementation of customs tariff regulation for imported products.
2. Interest rate recovery in case of investment loans is 40% of total amount of government support. Rosselkhozbank and Sberbank are the main lending entities. In 2014, only 3.55% business entities was involved into investment loan program. Investment loan interest rate was 15–19%.
3. According to results of cluster analysis, all Regions of the Russian Federation have been divided into 3 groups depending on government support amount and the results of its implementation. The first group involves regions with the smallest subsidies of 30 PLN per 1 ha of agricultural lands. These regions have also the smallest gross product of 1.09 thous. PLN per 1 ha. The amount of subsidies of the second group of regions is 76 PLN per 1 ha and gross product is 2.72 thous. PLN per 1 ha. The third group of regions has subsidies of 251 PLN per 1 ha of agricultural lands and gross product in this group is 3.72 thous. PLN per 1 ha. Crop capacity of wheat, milk yield and average monthly salary is also proportionally distributed. No matter of subsidies, profitability of companies is the smallest in the second group. Subsidies obviously increase profitability of companies that is proved by the third group of regions. Here subsidies increased the profit margin result from −1.94 to 15.89%.
4. The biggest output of investment subsidies is observed in the holdings belonging to the cluster 2.
5. Audit commissions and monitoring institutions of Ministry of Agriculture should control planned use of subsidies. Method of control is expected to include the following: preliminary control to provide soundness of a loan and legal validity of getting government support, current control to provide completeness of facilities and their proposed use; final control to check efficiency of facilities' utilization.

REFERENCES

Borniakov, E. (2011). International experience of government support of agriculture. The Bulletin of Izhevsk State Agricultural Academy, 2, 11–16.

Everitt, B., Landau, S. Leese M., Stahl, D. (2011). Cluster Analysis. 5th ed. Wiley, Chichester, UK.

Kolosova, T. (2016). International experience of government support of agriculture. Economics of Agricultural and Processing Companies, 5, 67–70.

Kontsevaya, S. (2016). Peculiarities of the State Support of Agricultural Product Manufacturers and Control of its Intended Utilization in Russia and Central European countries. The Bulletin of Izhevsk State Agricultural Academy, 3 (48), 62–69.

Lance, G., Williams, W. (1967). A general theory of classificatory sorting strategies: 1. Hierarchical systems. Computer Journal, 9, 373–380.

Makles, A. (2012). Stata tip 110: How to get the optimal k-means cluster solution. Stata Journal, 12, 347–351.

Webb, P., Block, S. (2010). Support for agriculture during economic transformation: impacts on poverty and undernutrition. Proceedings of the National Academy of Sciences of the United States of America, 31 July 2012, 109 (31), 12309-14.

ANALIZA I KONTROLA RZĄDOWYCH SUBWENCJI INWESTYCJNYCH W ROLNICTWIE W FEDERACJI ROSYJSKIEJ

STRESZCZENIE

Dotacje są ważną częścią rozwoju rolnictwa w Rosji. Zdecydowana większość gospodarstw rolnych ma ujemną marżę zysku bez wsparcia rządu. Porównując kwotę wsparcia rządowego w Polsce i Rosji, wynosiła ona 76,21 mln PLN na 1000 km² gruntów rolnych w Polsce wobec 6,35 mln PLN w Rosji w 2014 r. Taka sytuacja prowadzi do niskiej produktywności rolnictwa w Rosji. W związku z tym, że rosyjskie rolnictwo jest ekstensywne, rząd podjął decyzję, aby przyznać około 40% kwoty wsparcia na pokrycie kredytu inwestycyjnego przeznaczonego na rozwój materialnych i technicznych urządzeń rolniczych. Program ten nie jest popularny i obejmuje 3,55% ogółu gospodarstw rolnych. W celu oszacowania efektywności wykorzystania subsydiów przeprowadzono analizę skupień metodą k-średnich. Wyodrębniono trzy skupienia, w zależności od efektywności wykorzystania dotacji. Zalecane są procedury kontrolne w celu efektywnego wykorzystania wsparcia rządowego.

Słowa kluczowe: rolnictwo rosyjskie, wsparcie rządowe, efektywność wsparcia rolnictwa, analiza klastrów