Public-private partnership as a form ensuring food security in Russia

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Abstract. The development of the subjects of Russia has shown the need for adjustments to approaches providing the national food security of the country. This problem affects the penal system, which needs to be safely provided with foodstuffs. An integral part of solving this problem is the promotion of science-based models of effective cooperation of public funds and private capital with the consideration of specific production conditions. It is necessary to identify empirical gaps in the knowledge about the use of public-private partnership (hereinafter - PPP) mechanisms in the interests of ensuring the food security of the national penitentiary system. We assume that the application of PPPs in the agricultural industry can be considered one of the most relevant instruments facilitating the innovative development of the agricultural sector of the economy, free competition, protection the rights of the resource owners.

1. Introduction

Most countries of the world are concerned with the problems of providing the national food security. The governments of these countries adopt relevant legislative acts, work out state programs and consider strategies to achieve the stated goal. For example, some American states (California, Colorado, Georgia, Michigan, Oregon, Virginia, and Washington), there are both, centralized bodies that coordinate state policy on the use of PPP mechanisms in the interests of the state, and industrial agencies that carry out PPP projects under the supervision of centralized management. The leading countries of the world supported and maintain a high level of food self-sufficiency: the United States of America, France – 100%, Germany – 93%. It is noteworthy that in these countries agricultural holdings are created with the introduction of public-private partnership mechanisms, while the main goal in implementing PPP projects abroad is the mutually beneficial use of public resources and private capital in order to increase the efficiency of agricultural production. The works of foreign authors directly indicate the fact that many countries of the world create agro-industrial complexes based on the use of economic instruments of PPP to solve the problem of providing the population with enough food [1].

Russia is one of the countries most endowed with land resources. However, with the vast size of the territory – 17.1 million km², our country has a relatively small amount of land favorable for human life and economic activity. Over 10% of the country's area is occupied by unproductive lands of the tundra (8%), swamps and wetlands (15%), semi-deserts and deserts (5%), and high-mountainous regions. Farmland makes up only 23.5% of the total area of Russia, 70% of which are located in areas of risk
farming. Therefore, the preservation of any plot of land, maintaining its potential fertility, especially in the agricultural regions of the country, is the main state task.

The latest census of agricultural land showed that in Russia more than 44 million hectares have been withdrawn from circulation, i.e. not used as arable land, pastures and hayfields. The land is overgrown with weeds, woody vegetation, swamps. Therefore, it loses its primary purpose of producing agricultural products. A similar situation is observed in the penal system of Russia. Over the past 3 years alone, more than 21 thousand hectares have been withdrawn from the turnover of agricultural land. The territorial bodies of the Central, Southern, and Volga districts were especially distinguished in this area, on the territory of which there are considerable abandoned land plots, as well as irrational slaughter of livestock and poultry, which leads to food dependence of the penitentiary bodies on the third-party suppliers.

The Order No. 3 of the Ministry of Agriculture of the Russian Federation dated January 12, 2017 “On the Approval of the Forecast of the Scientific and Technical Sphere of the Agro-Industrial Complex” has outlined the most significant areas of scientific and technological development of the agro-industrial complex for the period up to 2030. The agricultural sector of the Russian Federation has already been supplied with innovative technologies for the production and processing of agricultural products based on the use of modern high-performance domestic and imported equipment. However, over the past decades, for various reasons, there has been no significant increase in the technical equipment of agricultural production in some state institutions. Under the circumstances, an important factor in increasing the efficiency of the agricultural sector is the reduction in the cost of performing mechanized technological operations. For this purpose the existing machines and equipment should be efficiently operated and the technical and technological potential inherent in them should be fully used.

The other way of increasing work efficiency is the application of scientifically based projects of the cooperation of private and public sectors in the agricultural industry of the economy.

The agricultural sector of Russia is characterized by the unique potential, which provides the possibility of its intensification and growth. Therefore, the future of the agricultural production is the use of highly productive and highly profitable technologies, which, in turn, are the basis for achieving the competitiveness of food produced.

A fundamentally new way of implementing state policy to increase the efficiency of food security in the penal system is mutually beneficial cooperation between the state and business in the field of development and strengthening of the country’s food security. The transfer of managerial, economic and organizational functions to private business will ensure the attraction of targeted, substantiated, supportive investments in the modernization of production assets, the construction and reconstruction of agricultural facilities of some state institutions in the country.

The use of public-private partnership forms in the world practice as a method of developing mutually beneficial cooperation between the state and business has been used for many years. The first PPP projects were successfully implemented in the fields of transport and energy, then this experience was applied to the construction, management of hospitals, schools.

The theoretical foundations of the study of the mechanism of public-private partnerships and issues of its regulation at the legislative level are reflected in the works of R. R. Shabanov, V. N. Mochalnikov, S. N. Silvestrov, V. G. Varnavsky, A. V. Klimenko, V. A. Korolev, M. A. Khatayeva [2-6].

The issues of developing public-private partnerships in the agro-industrial complex of the regions of the Russian Federation were dealt with by S. L. Sokolov, V. A. Sedik Yu. A. Akimova, S. A. Kochetkova, M. A. Kataeva, I. V. Moiseeva, T. M. Polushkina, S. A. Kovalenko, E. G. Yakimova, O. Yu. Avtaykina, J. A. Zakharova, P. N. Zakharov, M. Kozin, E. P. Radchenko, G. S. Pyrchenkova [7-12].

Foreign scientists have also been researching for a long time into the problems of public-private partnerships in various spheres of public activity, including the analysis of the mutually beneficial use of PPP projects in the agricultural sector of the economy. Among foreign authors studying this issue, we can distinguish: E. R. Yeskomb, M. B. Gerard, J. A. Hodge, S. Greve, F. Hartwich, S. Osborne [14-18].
The theoretical elaboration of the issue under consideration is quite deep. At the same time, the issues of introducing public-private partnership tools to solve the problems of innovative development of the agricultural sector in the Russian penal system remain poorly examined.

The present study of the mechanisms of the interaction between private capital and state resources to ensure food security of the Russian penitentiary bodies was carried out by means of observation, interviewing representatives of the agricultural sector and analysis of the data provided by the state.

2. Results

Despite the fact, that public-private partnerships are quite widespread in infrastructure projects, the use of such organizational and economic mechanisms in agriculture of the regions of the Russian Federation has not been widely spread. So, in special studies, it is noted that in 28 regions of Russia the use of PPP projects in the agricultural sector is in the initial stage, and in 20 Russian regions the level of application of PPP tools in agribusiness is extremely low [19]. At the same time, it is precisely this interaction of private business and state capital that could help in modernizing the agro-industrial complex and, as a result, bring benefits not only to agricultural producers and the state, but also to the society as a whole.

The Food and Agriculture Organization of the United Nations, whose goal is to develop agriculture in the third world countries, defines PPP in the field of agricultural business development as a formal partnership between state institutions and private partners, created to address sustainable agricultural development tasks, where the social benefits expected from the partnership are clearly defined, investment contributions and risks are shared, and all partners have active roles at each stage of a PPP project life cycle.

The category of the agricultural land is the most valuable for the state and society. Agricultural land in Russia is distributed so that most public sector institutions theoretically have the opportunity to develop agricultural production on an area of more than 100 hectares. 28.3% of the constituent entities of the Russian Federation possess from 100 to 500 hectares of agricultural land. 58.3% of the constituent entities of the Russian Federation have more than 500 hectares of available agricultural land.

In our time, the rational exploitation of the agricultural land has begun to become relevant, since these areas are not unlimited. But today in some regions there is no possibility of practical application of all agricultural territories. This state of agriculture, in many respects, is determined by the technical lag of the agricultural machinery and equipment, as well as by the low volume of this product receipt.

During our survey we received the answers of the respondents to the following questions: 1) the availability and degree of cultivation of agricultural land, 2) the availability and condition of agricultural machinery and equipment. The examination of 90% of the responses received from respondents showed that 17% of the respondents indicated a lack of agricultural land or a lack of ability to cultivate it. 90% of respondents of state institutions in some areas of agricultural activity indicated that the main problem of cultivating crops is the high wear and tear of existing machinery and equipment. Some government agencies and representatives of the agricultural sector reported that for the cultivation of agricultural land, contracts are being concluded with representatives of the business community for the provision of soil cultivation services, crop cultivation, and livestock farming.

| Years | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|-------|------|------|------|------|------|------|
| Ratio of total cultivated areas to total land areas, % | 17.68 | 19.42 | 20.68 | 26.79 | 26.29 | 19.58 |

The analysis shows that the ratio of cultivated areas to total ones till 2017 increased. In 2018, this ratio returned to the level of 2014, which, of course, shows a decrease in cultivated areas for agricultural purposes. These negative phenomena have occurred, including due to poor technical availability or lack of innovative technology.

A further study of the presented data on the current state of agricultural production at enterprises and institutions of the Russian penal system confirmed the conclusion about its low level of effectiveness.
For a number of commodity and raw material items, a low level of self-sufficiency is observed. At the same time, the low capital-labor ratio of production determines the relatively low level of the use of a bank of the agricultural land. A significant part of arable land has not been used for a long time and, as a result, is currently virtually withdrawn from the agricultural circulation. This situation leads to the threat of deprivation of the right to use land and the imposition of administrative fines.

Table 2 presents the main indicators of crop production at enterprises and production sites of institutions of the Federal Penitentiary Service of Russia. The results of the analysis of the presented data make it possible to draw conclusions about a sufficiently high level of security of the department with land resources. Calculations of the needs for the main types of crop production, as well as the volume of raw materials for the production of various types of products, taking into account the productivity indicators in the study period, make it possible to estimate the required agricultural land areas and compare their values with the actual resources that were on the balance sheet of enterprises and agencies of the department. Note, that the requirements for raw materials for food production were calculated based on the following output yields during processing: 1st grade flour – 72%, 2nd grade flour – 85%, rye flour – 95%, cereals – 60%, vegetable oil – 30% [8].

Table 2. Key indicators of crop production [8].

| Food Demand | 2012  | 2013  | 2014  | 2015  | 2016  |
|-------------|-------|-------|-------|-------|-------|
| Fresh cabbage, t | 22413.3 | 21281.8 | 14003.5 | 15685.4 | 14250.2 |
| Fresh onion, t | 8103.8 | 7682.2 | 7585.9 | 7243.1 | 7155.4 |
| Fresh beet, t | 6513.7 | 5886 | 5847.1 | 5534.6 | 5596.3 |
| Fresh carrot, t | 6992.6 | 6393 | 6362.6 | 6026.7 | 5962.2 |
| Open ground vegetables, total, t | 44023.4 | 41243 | 33799.1 | 34489.8 | 32964.1 |
| Late potato, t | 109367.3 | 100999.1 | 93522 | 83097.9 | 89947.9 |
| 1st grade flour, t | 26823.9 | 25427.9 | 28074.7 | 29813 | 25035.6 |
| 2nd grade flour, t | 47001.5 | 38800.2 | 38080.2 | 58556 | 42174.5 |
| Rye flour, t | 17484.5 | 16060.8 | 22146.3 | 34301 | 26791.8 |
| Cereals, t | 24641.2 | 21331.2 | 22250 | 22630 | 20935 |
| Vegetable oil, t | 5052.3 | 4624.3 | 4715.7 | 4155.4 | 4343.4 |

The need for raw materials for food

Food grain (for the production of the 1st grade and the 2nd grade flour), t
| 88386.3 | 77167.9 | 79727.8 | 105500 | 80546.2 |
| 18358.7 | 16863.8 | 23253.6 | 36016 | 28131.4 |

Grain crop for the production of cereals, t
| 34497.7 | 29863.7 | 31150 | 31682 | 29309 |

Total of grain crops, t
| 141242.7 | 123895.4 | 134131.4 | 173198 | 137986.6 |

Shrovetide crops, t
| 85889.1 | 78613.1 | 80166.9 | 70641.8 | 7383.78 |

Crop yield, center/ha

Grain crop
| 9.7 | 13.2 | 14.8 | 16 | 15.8 |
| 112 | 110.8 | 104 | 116.1 | 120 |

Open ground vegetables
| 131.5 | 159.4 | 153.3 | 180.8 | 172.8 |

Own crop production

Grain crop, t
| 33962.2 | 41384.6 | 43794.9 | 50025 | 53281.7 |
| 65737 | 60289 | 54965.5 | 73858.8 | 66252.3 |

Potato, t
| 21036 | 24949.3 | 23510.1 | 28331.4 | 26673.4 |

The total required area of arable land, ha

Required grain seeding area, hectare
| 165763.9 | 112006.7 | 108397.7 | 123104.2 | 102788.9 |
| 145611.1 | 93860.2 | 90629.37 | 108248.8 | 87333.31 |

Required potato seeding area, hectare
| 9764.9 | 9115.4 | 8992.5 | 7157.4 | 7495.7 |
Required seeding area of open ground vegetables, hectar
Required seeding area of shrovetide crops, hectar
The area of cultivated land, hectar, including:
Grain crop
Potato
Vegetables
Availability of seeding land
Level of arable land use
Self-maintenance
Grain crop
Potato
Vegetables

The results of the analysis show that, despite the high degree of provision with land resources, the level of arable land use was less than 60%. At the same time, complete self-sufficiency in crop production was not achieved. Grain crops, being the main type of raw materials for the production of a wide range of goods, remain a scarce commodity position in the intra-system supplies and are the subject of predominantly external purchases [8].

A sufficiently high level of self-maintenance in vegetable positions is not stable and determines the need for contacting external suppliers. The solution to these problems involves the choice of one of two scenarios for increasing production volumes during intra-system production: extensive or intensive. Note, that under the current conditions, both paths are quite capital intensive, because the return to agricultural circulation of lands actually withdrawn from it requires substantial investment. The capital intensity of an intensive development path is obvious and also requires significant investment.

The park of tractors and combines (grain and potato harvesters) of the agricultural units of the Russian penal system mainly consists of outdated samples of domestic production. Available equipment can maximally process up to 40% of the available seeding area. The lack of necessary equipment for the efficient planting, processing and harvesting of vegetables determines their small share in the total fund of crop production. High moral deterioration of potato harvesting equipment leads to significant losses during harvesting. At the same time, the high physical deterioration of potato harvesting equipment requires additional repair costs. It should be noted that in conditions of budget financing deficit, the current situation is objective.

The low capital productivity of crop production determines the corresponding yield in comparison with civilian agricultural enterprises. The relatively lower productivity of the plant-growing divisions of the Russian penitentiary system has a cumulative effect on the efficiency of all agricultural production.

Table 3 shows the main characteristics of the livestock production at the industrial complexes and production sites of the Russian penitentiary institutions. Having studied the obtained data, we came to the conclusion that the correctional system of the Russian Federation has a low level of provision with cattle and poultry meat, as well as milk and chicken eggs.

The minimum daily gain of pigs and cattle in the range of 1 - 1.2 kg, which are common for civilian enterprises, subject to the use of advanced feeding and keeping technologies, are difficult to reach for the department. This situation is also observed in the productivity of the dairy herd.

Table 3. Main indicators of livestock production [8].

| Food demand | 2012     | 2013     | 2014     | 2015     | 2016     |
|-------------|----------|----------|----------|----------|----------|
| Milk, t     | 44642.6  | 40734.8  | 42079    | 38905.9  | 36607.4  |
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**Egg, thousand pcs.** 79804.8 73574.7 73942.8 70661.3  68021
**Beef, t** 8718.8 9889.7 7829.2 7350.2  5057.1
**Pork, t** 10123.9 9925.5 9255.1 7550.6  9647
**Poultry, t** 5323.7 2369.5 3564.1 7516.3  6499.1
**Byproducts, t** 100.6 678.8 0 967.3  1327.4
**Meat, total, t** 24267 22863.5 20648.4 23384.4  22530.6

**Livestock and poultry, heads**

Cattle, including: 21394 21419 21278 21456  20651
Cows 7634 7427 7628 7168  6920
Pigs 128669 124927 112386 114137  116193
Poultry 181157 167483 156537 157628  183796

**Average daily weight gain of animals on fattening, g**

Cattle 284 271 250 269  283
Pigs 370 407 425 395  401

**Average annual milk yield from 1 cow, kg**

2587,8 2714.9 2791.9 2838.9  2818.4

**Average annual egg production of hens, pcs**

153 144 135 147  149

**Own production of livestock products**

Cattle meat, t 2246.8 2618.3 2797.8 2509.3  2680.2
Pork, t 11481 10886.5 9429.4 8394.6  9296.1
Chiken, t 810.3 870 1015.9 768.1  1102
Milk, t 19628.8 19306.3 19174.6 19522.9  18445
Egg, thousand pcs. 20985 23219.4 18999.6 19685.4  23352.9

**Self-maintenance**

Cattle meat 25.8% 26.5% 35.7% 34.1%  53.0%
Pork 113.4% 109.7% 101.9% 111.2%  96.4%
Chicken 15.2% 36.7% 28.5% 10.2%  17.0%
Milk 44.0% 47.4% 45.6% 50.2%  50.4%
Eggs 26.3% 31.6% 25.7% 27.9%  34.3%

The corresponding values of the ratios of the gain of animals on fattening and milk yield in the institutions of the penal system of Russia and civilian farms are also low. This is much due to the low level of organization of labor and production of livestock divisions of the penal system of Russia. The conditions of keeping and feeding animals, their sanitary protection and veterinary services do not allow talking about the possibilities of ensuring the required level of livestock productivity.

**Table 4.** Forecast of the long-term socio-economic development of the Russian Federation until 2030 according to the Ministry of Economic Development.

| Name of product               | 2011 Report | 2020 Forecast | 2030 Forecast | 2020 by 2011, % | 2030 by 2011, % |
|------------------------------|-------------|---------------|---------------|----------------|----------------|
| Agricultural production,%    |             | 123.0         |               | 102.3          | 131.2          |
| Grain, million t             | 94.2        | 107.0         | 119.0         | 127.0          | 131.6          |
| Cattle and poultry, million t| 11.0        | 14.4          | 14.6          | 15.2           | 131.1          |
| Milk, million t              | 31.6        | 37.6          | 37.6          | 42.5           | 118.8          |

At the same time, according to the forecast of the long-term socio-economic development of the Russian Federation until 2030 from the Ministry of Economic Development by 2011, public investment
in the fixed assets in agriculture will grow 1.7-2.1 times, which will undoubtedly contribute to the
development of competition and attract private investment in the country's agriculture.

In order to increase the economic security of the regions of Russia and the innovative development
of the agricultural sector in the penal system, it is proposed to introduce modern technologies for
organizing mutually beneficial public-private agricultural production, namely: the creation of a rabbit-
breeding complex on the basis of abandoned farms and marginal agricultural land of the penitentiary
bodies. The cultivation of rabbits using intensive reproduction technology involves the use of industrial
hybrid rabbits, their artificial insemination and the creation of optimal rabbit density per unit area, which
allows to obtain the required quantity and frequency of yield of the product (rabbit meat). Unlike small
rabbit-breeding farms, such rabbit-breeding complexes will be able to ensure stable production and
supply of rabbit meat to large trading networks and processing enterprises, as well as provide dietary
meat to the necessary segments of the population and government agencies, including structural units
of law enforcement agencies and correctional institutions.

The creation and implementation of such a project is dictated by the requirements of mutual
consideration of regional and sectoral development. The accelerated development of the industrial-
agrarian rabbit-breeding production complex will lead to the sustainable development of the region,
increase of social and economic parameters of the development of territorial management systems. It
should be noted that the implementation of this type of public-private partnership requires consideration
of interests and consistent operating conditions for enterprises of all industries that form the potential of
the region and largely determine its socio-political stability.

Both, the state and private organizations are seriously concerned about the lack of industrial
production of rabbit meat in Russia, because the demand for this dietary and hypoallergenic product is
growing. Rabbit meat is widely in demand. It is the meat which is used for feeding of infants. So, it is
difficult to overestimate its useful properties especially when feeding nursing mothers, allergy sufferers,
and athletes. At the same time, the analysis of the market structure of 2018 showed that, in physical
terms, imported rabbit products accounted for 33% of the volume of production, and domestic - about
67%.

![Figure 1. Dynamics of the structure of the Russian rabbit meat and byproducts market, %](image)

The proposed project uses a commercial hybrid from the crossing of New Zealand and California
rabbits. Distinctive features of the cross: precocity and multiplicity of females. Each female rabbit is
able to produce 8-10 broods per year. The average number of rabbits in one brood is 9-12; there is a
good milkiness of females. Compared with pure lines, hybrids show the following advantages: fertility
of 80-85 %, rabbits born alive 9-11, weaners 8-10, weaners per year from one female rabbit 70-85.
Rabbits obtained as a result of breeding have the following parameters: weight on the 77th day 2.45-2.55 kg; output on the 77th day: up to 60 %. On average, 78 rabbits are born from one female; the weight of pure rabbit meat is about 1.5 kg. During her life, a female rabbit can produce 117-120 kg of pure meat. The method of artificial insemination permits to inseminate a larger number of female rabbits at the same time than with natural fertilization. It allows to use intensive production, as well as a certain standardization of cycles and working time. In addition, this method guarantees a high percentage of fertility even in summer, when natural fertilization reduces this indicator. Thus, production rhythms remain constant throughout the year.

Due to economic reasons, it is expedient to equalize broods of rabbits: up to 11 rabbits in summer, in order to get more rabbits for slaughter in autumn. It is in summer that a female rabbit consumes less feed, and this practice should be limited, since there is a risk of negative impact on productivity.

![Capital cost structure](image)

**Figure 2.** Capital cost structure.

Budget performance indicators reflect the impact of project implementation on revenues and expenditures of the republican and local budgets. The main indicators of the budgetary effectiveness of this project are:

- over 10 years of the project implementation, the budgets of different levels will receive: deductions in the form of taxes - 142,874.29 thousand rubles;
- including contributions to the pension fund, compulsory medical insurance fund, social insurance fund and other funds of the Russian Federation - 85,505.52 thousand rubles.

For the implementation of the project, new permanent jobs will be created, which is an important economic indicator at the current level of unemployment. Over the 10 years of the implementation of the project of the public-private rabbit-breeding complex, its employees will be paid 283,130.88 thousand rubles of wages, which will also positively affect the welfare of residents of the region.

3. **Discussion**

Today we cannot but pay attention to the need to introduce innovative technologies in the agricultural sector of some state institutions. It must be understood that an important condition for organizing efficient agricultural production is the optimal formation and rational use of the material and technical basis of the agricultural sector, as well as the accelerated implementation of effective, resource-saving technologies based on high-performance agricultural equipment.

For the formation of an effective innovation policy in the agricultural sector, the solution of certain problems is necessary. We can state that rational provision of the agricultural sector with modern equipment and modernization of the existing technical base requires the creation of joint agricultural holdings and attracting private capital in the interests of ensuring food security of the state. Creating conditions for increasing the level of mechanization of agricultural work is possible with the involvement of business community entities. To facilitate agricultural production, it is also necessary to
develop mutually beneficial cooperation with the government of the regions and regional ministries of agriculture and trade.

4. Conclusions

Based on the above, it can be concluded that the agricultural sector of the Russian economy needs to implement the most promising innovative technologies that should provide a significant increase in labor productivity, fuel and energy savings, and create optimal conditions for the cultivation of agricultural crops and the development of livestock complexes. Introducing PPPs in agro-industrial complex of Russia will lead to lower costs and the sharing of financial risks of business entities, growth of large industrial farms at the expense of crowding out of small farms and inefficient agricultural organizations, the expansion of deep processing of agricultural products.

According to the analysis of theoretical and methodological aspects of the problem, public-private partnership is the best form of organizing innovative and investment activities in agribusiness, which will increase the productivity and competitiveness of domestic agribusiness. Considering all above, we can single out the PPP project of a public-private rabbit breeding complex based on the low-profit land owned by a penal institution as one of the promising directions that will ensure an increase in the volume of meat production and processing meat products. This project should use highly productive hybrids, full-fledged feeds, complex mechanization and automation of technological processes for growing young rabbits and keeping adults, a system of veterinary and preventive measures, deep processing and storage of products, and the creation of logistics centers. The experience of implementing the project of a public-private rabbit breeding complex on the basis of low-profit land can serve as an example of expanding the range of partner activities in agriculture in the Russian Federation with an emphasis on ensuring food independence and security of state bodies.

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