





Production Capacity as a Factor of Sustainable Development of Agricultural Enterprises

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Abstract: The article presents the materials of theoretical and empirical studies of the impact of the use of production capacities of agricultural enterprises on the sustainability of their development. For the modern period of development of the agro-industrial complex is characterized by such an important landmark as the need to accelerate the renewal of production on the basis of the development of advanced scientific and technical achievements. Greenhouse vegetable growing occupies a significant place in solving the problems of food security of the country. The active attraction of large-scale investments in the greenhouse industry in 2016-2019 made it possible to launch large-scale industrial greenhouses with tens of thousands of tons of gross harvest. In 2020, even taking into account the decline in state support and the reduction in the number of new investment projects, the gross harvest continued to grow, thanks to the full capacity of already built greenhouse complexes and the reconstruction of old greenhouses. On the example of JSC SOVKHOZ-VESNA, the use of production capacities in the vegetable growing of protected soil was evaluated and the impact of the efficiency of their use on the sustainable development of the economic entity was determined.


1 INTRODUCTION


The main role in meeting the needs of the population for fresh vegetables and herbs in the off-season is played by greenhouse vegetable growing (Nikitin, A., 2019). Greenhouse production offers an order of magnitude greater production of environmentally friendly products than in the open ground, and allows you to organize a year-round production cycle regardless of natural and climatic conditions. The maximum allowable production of greenhouse products according to the approved assortment sales plan based on the full use of the necessary production equipment and production areas is the production capacity. At the same time, it is important to take into account advanced technologies and progressive organization of work and production.

The effective use of production capacity depends on the implementation of the main task of this stage of economic transformation – improving the quality of products, since high competition in the market contributes to faster sales and high demand for high-quality products. Retail chains and catering companies constantly need fresh, high-quality greenhouse products. Year-round functioning greenhouse production makes it possible to constantly receive significant income. Along with high profitability, good profitability and a quick return on investment, greenhouse production has many other advantages. The optimal use of production capacity in greenhouse production has a positive impact on the economic indicators of the functioning of production entities. This ensures an increase in production volumes and reduces its cost.

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Among other things, the amount of monetary investments that contribute to the growth of production volumes is reduced. There is also a saving of labor, embodied in the main production assets, due to more intensive use of equipment, etc. Practical reality confirms that today the production capacity in the Russian Federation is on average loaded by no more than 60%. In a significant part of industrial entities, the load is no more than 30%. Better utilization of production capacity means, among other things, faster turnover. And this greatly helps to solve the problem of reducing the spread in the terms of physical and moral wear and tear, increasing the rate of renewal of fixed assets.

2 MATERIALS AND METHODS

Currently, the greenhouse industry in Russia is developing due to the large-scale introduction of modern agricultural technologies, equipment, structures, selection achievements, optimization of business processes, improvement of pre-sale preparation of products, expansion of geography and sales channels. According to Rosstat, over the past three years, the Russian Federation has seen a small but steady increase in greenhouse areas, which in relative terms amounted to 11%. According to the plans of the Ministry of Agriculture, by 2021 the size of the production area should be increased by almost one and a half times, that is, at least 2 thousand hectares of greenhouses will be built (World, 2018). Internal competition in the market of domestic producers is actively developing, while its level varies greatly depending on the region (Ananiev, 2019). The share of the TOP 10 regions accounts for 49% of the used areas of winter greenhouses, the Saratov region takes the 8th place in this list. Currently, the profitability of newly built greenhouse complexes reaches 40%. The profitability of old greenhouses, characterized by high energy consumption and non-year-round harvest time, is 15-30%. All this helps to significantly increase the commercial attractiveness of growing vegetables in greenhouses, not only for specialized, but also for non-core investors. For this reason, the construction of more than a hundred large (20 ha) and medium (10-20 ha) greenhouses has already been announced. In general, over the past 3 years, many interesting new products have been introduced in Russia, which has allowed the industry to constantly develop. In addition, state support also contributes to the development of the industry: compensation for the cost of building greenhouses in the amount of 20%

(for the Far Eastern regions, compensation will be 25%) and soft loans-1-5% per year. From 2020 to 2022, 80 investment projects in the field of closed-ground vegetable production have been approved in Russia, including 50 projects that are already being implemented, and 30 that are planned for implementation. At the same time, the total annual capacity was 937.6 thousand tons, the volume of investments – 247.7 billion rubles (Russian market, 2020).

Further growth in the economic efficiency of production is possible on the basis of a more complete use of the production reserves of the agricultural enterprise. Based on this, the key is to determine the significant indicator/indicators that most informatively characterize the production capabilities of the organization. The main indicator is the production capacity of the enterprise and the level of its use. The production capacity of an agribusiness enterprise is the ability of fixed assets assigned to it to the maximum allowable volume of a certain type of product in the most efficient use of existing equipment and production areas. At the same time, the applied technologies and the organization of production should be as perfect as possible. The production capacity of an agricultural enterprise is an estimated indicator of the maximum or optimal volume of production for a certain period (decade, month, quarter, year). The optimal volume of production is calculated to determine the moment when the volume of products produced will meet the needs of the market, as well as the necessary stock of finished products in case of changes in the market situation or unforeseen circumstances. The determination of the maximum possible volume of products produced is necessary in order to identify its reserve in cases where the agro-industrial entity performs the maximum possible operation. In practice, an annual production plan (production program) is developed, which allows you to visualize the production capacity of an economic unit. The assessment of production capacities of enterprises is carried out to analyze the level of technical equipment of production. This will allow us to determine the intra-production reserves for increasing the efficiency of using production capacities. Insufficient use of the production capacity of agro-industrial enterprises contributes to an increase in the share of fixed costs, an increase in the cost price and a decrease in profitability. In this regard, it is necessary to identify analytically the changes that have occurred in the production capacity of an economic entity, the completeness of its use and the impact of these characteristics on cost, profit, break-even and other

economic indicators (Moiseenko 2017; Myasnyankina, 2019; Bashirzade, 2021).

Production capacity is determined both for the business entity as a whole, and for individual structural divisions or production sites. To determine the maximum possible volume of production, the main production sites are used as a basis, which are involved in the main technological operations of manufacturing products and perform the greatest amount of work in terms of complexity and labor intensity.

Most often, the effectiveness of the analytical assessment is influenced by the justification of the system of indicators that allow you to determine the intensity of the use of production capacity. This system is divided into the following groups: the first includes coefficients that characterize the use of production and the level of development of the design capacity of the subject; the second contains indicators that describe the use of equipment, the third-the cost characteristics of the output of production. Thanks to the system of indicators, you can get fairly reliable information about the level of production capacity utilization. Based on the information received, a comprehensive analysis of the use of the existing production capacities of the organization and its divisions is carried out in order to determine the sequence of implementation of reserve measures to improve the use of production capacities (Zhulina, 2018; Litvinov, 2018).

Taking into account all the above, we will evaluate the production capacity of the agricultural enterprise, LLC SOVKHOZ-VESNA, engaged in the

production of greenhouse products, and determine the impact of the efficiency of their use on the stability of the functioning of the economic entity.

3 RESULTS AND DISCUSSION

The results of economic activity of JSC SOVKHOZ-VESNA are significantly influenced by the labor resources and the efficiency of their use. The efficiency of using the production capacities of JSC SOVKHOZ-VESNA depends on the effectiveness of this resource. Analysis of the dynamics of labor productivity for 2018-2020 showed that the growth rate of product sales exceeds the growth rate of the number of employees, including workers. Consequently, the growth rate of the average annual output of both per worker and per worker over the course of three years tends to increase. The average annual output of one operating JSC SOVKHOZ-VESNA increases by 7.24% in 2020 compared to 2018 and remains virtually unchanged in 2020 compared to 2019. The average annual output per working unit of JSC SOVKHOZ-VESNA increases by 6.47% in 2020 compared to 2018 and decreases by 0.55 % in 2020 compared to 2019. Similar dynamics can be traced in the average daily and average hourly output of 1 working greenhouse production. The negative fact is that the labor intensity indicator in 2020 compared to 2019 increased by 2.17%, that is, the cost of physical units of time per 1 ruble of output increased.

Table 1: Indicators of the use of working time and the production of the labor unit of JSC SOVKHOZ-VESNA for 2018-2020.

Economic indicator	2018	2019	2020	2020 deviation from			
				2018		2019	
				(+,-)	%	(+,-)	%
Source data							
Volume of sales of products (services), thousand rubles.	812,840.00	856,104.00	845,205.00	32,365.00	3.98	-	-1.27
Number of employees, people	626	612	607	-19.00	-3.04	-5.00	-0.82
including workers	557	548	544	-13.00	-2.33	-4.00	-0.73
Worked by one worker during the year, days	206	205	210	4.00	1.94	5.00	2.44
Average working day duration, h	7.90	8.00	8.00	0.10	1.27	0.00	0
Calculated data							
Share of workers in the total number of employees, %	88.98	89.54	89.62	0.64	-	0.08	-
Total amount of time worked per year:							
by all workers, person-hour	128,956.00	125,460.00	127,470.00	-1,486	-1.15	2,010.00	1.6
one worker, person-hour	1,627.4	1,640.00	1,680.00	52.6	3.23	40.00	2.44

Table 1: Indicators of the use of working time and the production of the labor unit of JSC SOVKHOZ-VESNA for 2018-2020 (cont.).

Average annual output:							
1 worker, thousand rubles.	1,459.32	1,562.23	1,553.69	94.37	6.47	-8.54	-0.55
1 employee, thousand rubles.	1,298.47	1,398.86	1,392.43	93.96	7.24	-6.43	-0.46
Average daily output 1 worker, rub.	11,312.56	12,398.65	12,138.2	825.64	7.3	-260.45	-2.1
Average output per hour 1 worker, rub.	1,431.97	1,549.83	1,517.28	85.31	5.96	-32.55	-2.1
Labor intensity, person-hour/ rub.	0.698	0.645	0.659	-0.039	-5.59	0.014	2.17

The increase in the average annual output of one worker and worker of JSC SOVKHOZ-VESNA predetermined the impact of the following changes: the average output per hour; the number of days worked by one labor unit and the length of the

working day. The absolute impact of factors on the change in the level of average output per year of working units was determined by the method of absolute differences (Table 2).

Table 2: Results of the influence of factors of working time use on the change in the average annual output of one working unit by the method of chain substitutions in JSC SOVKHOZ-VESNA for 2019 and 2020.

Specific weight of working units, %	The number of working days of one working unit per year, people-days	Working day duration, hour	Production of one working unit on average per hour, rubles.	Production of one working unit on average per year, thousand rubles.	Changes in the average annual output of one working unit, thousand rubles, (+/-)
2019 (base period)					
2018 - 88,98	2018 - 129	2018 - 7,9	2018 - 1,431,97	1,298.47	-
2019 - 89,54	2018 - 129	2018 - 7,9	2018 - 1,431,97	1,306.71	8.24
2019 - 89,54	2019 - 126	2018 - 7,9	2018 - 1,431,97	1,276.32	-30.39
2019 - 89,54	2019 - 126	2019 - 8	2018 - 1,431,97	1,292.48	16.16
2019 - 89,54	2019 - 126	2019 - 8	2019 - 1,549,83	1,398.86	106.38
The result of all factors					100.39
2020 (reporting period)					
2019 - 89,54	2019 - 126	2019 - 8	2019 - 1,549,83	1,398.86	-
2020 - 89,62	2019 - 126	2019 - 8	2019 - 1,549,83	1,400.09	1.23
2020 - 89,62	2020 - 128	2019 - 8	2019 - 1,549,83	1,422.31	22.22
2020 - 89,62	2020 - 128	2020 - 8	2019 - 1,549,83	1,422.31	0.00
2020 - 89,62	2020 - 128	2020 - 8	2020 - 1,517,28	1,392.44	-29.87
The result of all factors					-6.42

This increase was due to the following changes:

- the share of workers increased by 0.56 percentage points (from 88.98 to 89.54%). This led to an increase in the result by 8.24 thousand rubles;
- the number of days worked per one labor unit per year decreased by 3 people/days (from 129 to 126 people/days). This fact affected the decrease in the effective indicator by 30.39 thousand rubles;
- the working day length increased by 0.1 hours (from 7.9 to 8 hours), which led to an increase in the average output for the year by 16.16 thousand rubles;

- the average output per hour of one working unit increased by 117.86 thousand rubles (from 1,431.97 to 1,549.83 thousand rubles). This resulted in an increase in the effective indicator by 106.38 thousand rubles;

The reporting period is characterized by a negative final result – a decrease in the average annual output compared to the base period by 6.42 thousand rubles. This negative trend is explained by:

- a slight increase in the share of workers by 0.08% (from 89.54 to 89.62%). This led to an increase in the effective indicator by 1.23 thousand rubles;

- increase in the number of working days per working unit per year by 2 people/day (from 126 to 128 people/day). This fact affected the increase in the effective indicator by 22,22 thousand rubles;
- a decrease in the average hourly output of one labor unit by 32.55 thousand rubles (from 1,549.83 to 1,517.28 thousand rubles). This resulted in a decrease in the effective indicator by 29.87 thousand rubles.

Next, we will consider the provision of JSC SOVKHOZ-VESNA with the main production funds. The largest share in the structure of fixed assets is occupied by buildings, structures and transmission devices: in 2020, this figure was 78.43%. The smallest share is accounted for by production and

household inventory, which is only 0.01% of the total amount of all fixed assets (Fig. 1). Decrease in the cost of fixed assets in 2020 (1,207,819 thousand rubles) compared to 2018 (15,300.92 thousand rubles) by 322,273 thousand rubles. or 21.06% is associated with the disposal of items of fixed assets that are morally and physically worn out and monthly depreciation. The share of machinery and equipment in the enterprise in 2020 is 11.37% of the total fixed assets.

The following equipment is installed in JSC SOVKHOZ-VESNA: ventilation system; air recirculation complex; drip irrigation system; CO2 plant feeding system; artificial seedling lighting system; heating system. Each of these elements increases the possibilities of greenhouses for the output of finished products.

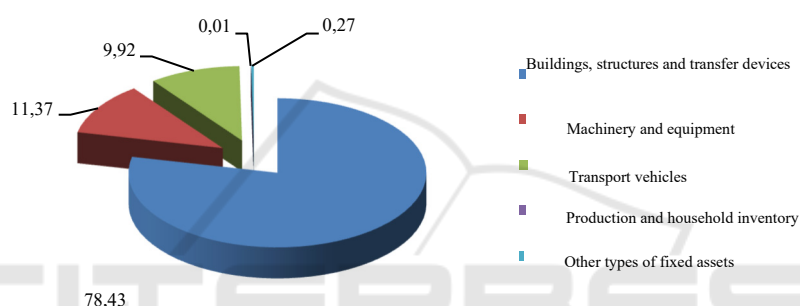


Figure 1: Structure of fixed assets of JSC SOVKHOZ-VESNA in 2020.

When analyzing the condition of the equipment, special attention is paid to its physical and moral wear and tear (the equipment may completely fail due to wear and tear) (Table 2). The following results are obtained. The coefficient of renewal of machinery and equipment in 2018 was 24.3%, in 2019 its value increased to 26.2% due to an increase in fixed assets (purchase of a truck, updating of irrigation systems, heating, etc.). In 2020, the renewal rate decreased to 1.2%. The disposal rate was 1.4%, 26.1% and 3.0%, respectively. A fairly significant disposal was observed in 2019 when replacing a completely worn-out irrigation system. The equipment wear rate in 2020 is 39.1% (the critical acceptable value of the wear rate is 50%), and the shelf life rate is 60.9%, respectively. Consequently, the company does not

have sufficient quantity and quality of fixed assets for the implementation of production and economic activities, since at present the machines and equipment are almost half worn out. The consequences of wear and tear are manifested in various aspects of the activities of JSC SOVKHOZ-VESNA: in a decrease in product quality; a drop in the production capacity of equipment and its technical productivity; an increase in the cost of maintaining and operating equipment; an increase in unplanned downtime associated with equipment malfunction; a change in the duration of the repair cycle; an increase in maintenance and repair costs, etc.

Thus, it is inefficient to operate morally and physically outdated equipment, so it must be replaced before the state of physical wear and tear occurs.

Table 3: Characteristics of the state and movement of the equipment of JSC SOVKHOZ-VESNA in 2018-2020.

Economic indicator	2018	2019	2020
Source data			
Fixed production assets, thousand rubles	1,530,092	1,539,953	1,207,819
Table 2: Continued			
Active part of production assets, thousand rubles	1,149,099	1,190,384	869,629
Functioning equipment, thousand rubles.	139,872	139,931	137,351

Table 3: Characteristics of the state and movement of the equipment of JSC SOVKHOZ-VESNA in 2018-2020 (cont.).

Number of units of functioning equipment, units	22	27	25
Equipment at the beginning of the time period, thousand rubles.	107,351	139,872	139,931
Received equipment, thousand rubles.	33,979.1	36,661.2	1,648.2
Retired equipment, thousand rubles.	1,458.1	36,602.2	4,228.2
Equipment at the end of the time period, thousand rubles	139,872	139,931	137,351
Calculated data			
Functioning equipment in the cost of the active part of production assets, %	12.2	9.1	11.4
Active part of fixed assets, %	75.1	77.3	72.0
Relative input rate, %	24.3	26.2	1.2
Relative disposal rate, %	1.4	26.1	3.0
Relative growth rate, %	30.3	0.04	-1.84
Relative wear rate, %	35.5	32.8	39.1
Relative shelf life, %	64.5	67.2	60.9

To develop measures to improve the use of equipment, it is necessary to monitor the age composition of various types of equipment, determining their suitability. The age composition is characterized by the grouping of equipment by service life. There is a positive trend of a small increase in the share of "young" equipment (age groups up to 5 years and 5-10 years). In this case, we can conclude that the company commissioned new equipment in 2018 and 2019, and as a result, the share of "young" equipment increased to 27.20% in 2019, compared to 27% of the level of 2018. Most of the equipment for the production of greenhouse vegetables has a sufficient service life. The average age of the machines is: $(5,7 \cdot 5 + 21,5 \cdot 10 + 67,7 \cdot 20 + 5,1 \cdot 30) / 100 = 17,5$ years. The standard life of the equipment is 30 years. The equipment of JSC SOVKHOZ-VESNA was used for 58,3% ($17,5 / 30 \cdot 100\%$).

If the service life of the equipment is long enough and exceeds the standard values, then the technical and economic characteristics of the equipment deteriorate. This applies to the accuracy of product processing, the productivity of equipment, and the growth rate of production volumes. In addition, the quality of the products themselves deteriorates, and production errors increase. At the same time, the cost of repairing and operating the equipment increases significantly.

The analysis of the efficiency of the use of the main production capacities (Table 4) based on the factor analysis of the return on funds showed that JSC SOVKHOZ-VESNA received products in the amount of 0.53 rubles from each ruble invested in the main production assets in 2018, and 0.69 rubles in 2020. The increase in capital productivity in 2020 compared to 2019 by 0.14 points and the decrease in capital intensity by 0.34 points is a positive change. The increase in the return on capital ratio allows you to save current operating costs. This occurs as a result of a decrease in the amount of depreciation charges per unit of income. In this case, a corresponding profit increase is generated. As a result, it expands its opportunities for material incentives for workers, industrial and social development.

Over the past three years, the labor capital ratio has decreased by 526,446 thousand rubles or by 20.9%, which is a negative trend. The specified decrease in the labor capital ratio per 1 employee was due to a decrease in the cost of fixed assets by 21.6% or 322,134 thousand rubles and the number of employees by 5 people. In 2019, for every 100 rubles of spent fixed assets, 8.69 rubles of profit was received, in 2020-11.55 rubles, which increases the efficiency of operations.

Table 4: Factor analysis of the capital return of fixed assets of JSC SOVKHOZ-VESNA in 2019-2020.

Economic indicator	2019 (base period)	2020 (reporting period)	Deviation of the reporting period from the reference period, (+, -)	Growth rate, %
Source data				
Volume of crop production, thousand rubles	822,801	814,326	-8,475	98.9
Fixed production assets, thousand rubles	1,539,953	1,207,819	-332,134	78.4
Functioning equipment, thousand rubles.	139,931	137,351	-2,580	98.2
Number of units of functioning equipment, units	25	27	+2	108.0

Table 4: Factor analysis of the capital return of fixed assets of JSC SOVKHOZ-VESNA in 2019-2020 (cont.).

The average cost of a unit of functioning equipment, thousand rubles	7,200	7,963	+763	110.5
Number of working days (Tdn)	215	216	1	100.5
Number of machine shifts worked (Tsm)	5,805	6,882	+1,077	118.6
Duration of one shift tem, h	8	8	-	100
Useful operating time of the equipment (Tp), h	1,271	1,423	152	111.9
Calculated data				
Relative load indicator of the equipment during the shift (Kz)	0.684	0.698	+0.014	102.0
Relative shift rate (Ksm)	1.08	1.18	0.1	109
Average hourly output per unit of equipment, thousand rubles	25.895	21.195	-4.7	81.8
Capital return of functioning equipment, rub./rub.	5.88	5.93	0.05	100.9
Fund return of OF, rub./rub.	0.53	0.67	0.14	126.4
Fund capacity of the OF, rub./rub.	1.79	1.45	-0.34	81.0
Labor capital ratio, thousand rubles/person	2,516.26 3	1,989.81 7	-526.446	79.1
Return on fixed assets, %	8.69	11.55	2.86	-

The impact of various factors on the change in the effective indicator-the return on funds of JSC

SOVKHOZ-VESNA-is determined by the method of chain substitution (Table 5).

Table 5: Assessment of the impact of factors on the return on capital of functioning equipment

Factor	The size of the impact on the return on capital of functioning equipment	Share of influence, %	The size of the impact on the return on funds	Share of influence, %
The first level of influence				
Specific gravity of the active part	-	-	-0.028	-20.0
Specific weight of functioning equipment	-	-	0.0974	69.57
Capital return on functioning equipment	-	-	0.0706	50.43
Total	-	-	0.14	100.0
Second level of influence				
Equipment changeability	0.423	5.62	0.0039	2.79
Loading equipment	0.102	1.35	0.00095	0.68
Performance of a unit of equipment	-0.924	-12.27	-0.00866	-6.19
Average price per unit of equipmen	7.927	105.3	0.0743	53.07
Total	7.528	100.0	0.07049	50.35

In the reporting period, compared to the reference period, there is an increase in the relative indicators of shift and equipment load. This indicates a reduction in downtime losses during the day and within the shift. This fact has a positive effect on the change in the return on capital of the equipment. The decrease in the share of the active part of fixed assets had a negative impact on the first level of influence.

The ratio between the value of the influence of each factor and the value of the deviation of the return on capital from fixed assets is calculated. As a result, the influence of each factor on the variation of the aggregated indicator was established.

The decrease in the productivity of a unit of equipment had the strongest negative impact on the return on assets.

The influence of the third-level factors on the return on funds was determined by analyzing the relative indicators of the use of the time balance. These include the relative shift indicator and the relative load indicator. The possibility of assessing the impact of downtime on the relative load of equipment arises if this characteristic is considered as the ratio between the useful and nominal time. In turn, the effective time depends on a number of factors. These include: the planned time of preventive maintenance, the time of equipment modernization, and other technological reasons.

Thus, the impact of in-shift downtime on the aggregate indicator-return on funds-is defined as the influence of third-level factors. All factors taken into

account for changes in capital productivity and growth in output can be divided into two groups (Figure 2, Table 6).

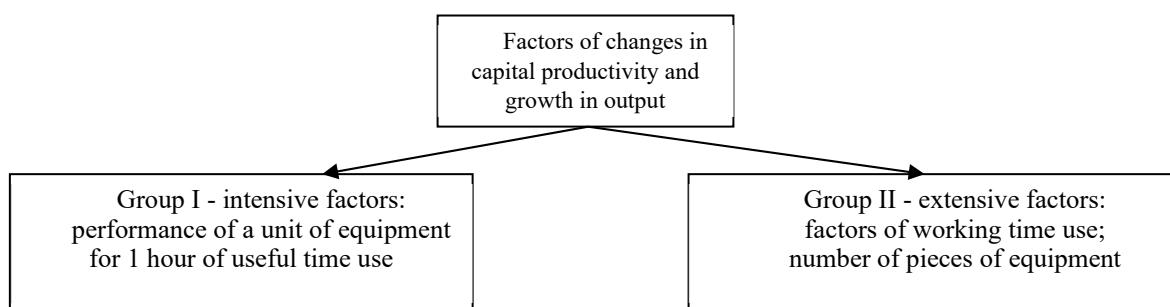


Figure 2: Factors of change in return on funds and growth in output.

Table 6: Calculation of the integral indicator of the production use of equipment.

Indicator	2019	2020	Deviation	Rate of change, %
Relative index of extensive loading	3.63	4.39	0.76	120.94
Relative index of intensive loading	0.2589	0.2119	-0.047	81.85
Integral load indicator	0.9398	0.93024	-0.00956	98.98

The integral indicator of the production use of equipment has increased as a result of an increase in the extensive load of equipment. At the same time, there is a decrease in intensive loading. This fact indicates that there are untapped opportunities to increase production volumes without attracting additional capacity and new capital investments. This indicator can be increased by eliminating production bottlenecks. It is possible to achieve the desired result by optimizing the organizational and technical level of production.

In general, it is advisable to divide the main directions of improving the use of production capacities of enterprises of the agro-industrial complex into extensive and intensive ones (Figure 3).

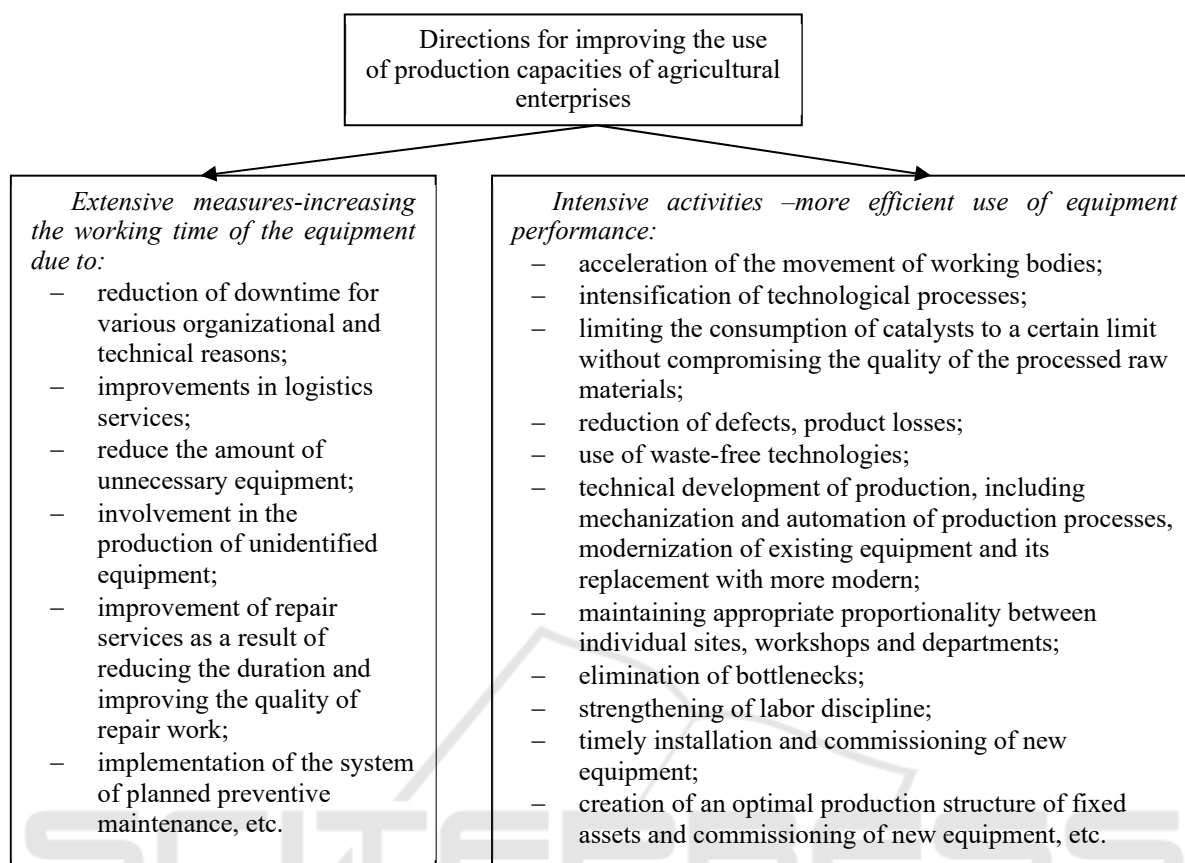


Figure 3: Directions for improving the use of production capacities of agricultural enterprises

4 CONCLUSIONS

To improve the use of production capacities of JSC SOVKHOZ-VESNA, a whole range of measures is needed. It is required to reduce equipment downtime or replace it with a new, more modern one. It is important to increase the number of basic production labor units that can produce more products. It is possible to increase the productivity of workers by setting a shift schedule or increasing output. At the same time, it is necessary to attract bonus systems for the implementation of an increased production plan. It is important to improve the skills of a key part of the industrial and production personnel – production workers, namely: to train existing specialists or hire new highly qualified specialists. Improved capacity utilization can also be achieved by reducing the labor intensity of manufacturing a unit of production.

An important prerequisite for the development of a set of measures to improve the use of production capacities and fixed assets of companies is the forecast of growth in the production of goods and services. This can be achieved mainly through the full

and efficient use of on-farm reserves. Rational operation of machinery and equipment, increasing the relative shift rate, reducing or eliminating downtime will also improve the efficiency of production capacity utilization. In addition, it is important to pay attention to reducing the development periods of newly commissioned capacities. Thus, it can be concluded that the fixed assets and production capacities of the enterprise are one of the main factors for the sustainable development of the agro-industrial complex.

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