**ПРО СЕЛЬСКОЕ ХОЗЯЙСТВО В РОССИИ**

Traditionally, it is customary to consider agriculture as a branch of the economy, whose main direction is characterized by the provision of food to the population and the production of plant and livestock raw materials for other industries. In other words, agriculture can be classified as one of the key sectors of the economy of any country throughout the history of statehood. Unlike industry, agricultural production is closely related to nature, characterized by seasonality of labor in accordance with the cyclical process of plant growth and development, overcoming climatic risks. Agriculture is not only a branch of the economy, but also a way of life of the rural population, the result of human cooperation with nature. The main branches of agriculture are crop production and animal husbandry, which are divided into smaller branches.

To fully understand the state of affairs in the agricultural industry in Russia, it is necessary to start the analysis from the basic, that is, from the population of Russia. As you might guess, due to the peculiarities of the industry, namely the need for a large area for cultivated land, enterprises of the agricultural complex cannot fully exist in cities. In other words, it is necessary to pay attention to the number of people living in rural areas. It is this part of the country's population that is the main labor force in this sector of the economy.

Table 1. Composition of the population in Russian Federation[[1]](#footnote-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Years | Overall number of people, mln | Number of people in rural areas, mln | The proportion  of the rural population, % |
| 1990 | 147,7 | 38,9 | 26,4 |
| 2000 | 146,9 | 39,5 | 26,9 |
| 2010 | 142,8 | 37,8 | 26,4 |
| 2016 | 146,5 | 37,9 | 25,9 |
| 2017 | 146,8 | 37,8 | 25,7 |
| 2018 | 146,9 | 37,6 | 25,6 |
| 2019 | 146,8 | 37,3 | 25,4 |
| 2020 | 146,7 | 37,2 | 25,3 |
| 2021 | 146,2 | 36,9 | 25,2 |
| 2022 | 145,6 | 36,7 | 25,2 |

As can be seen from the table above, the proportion of the population in rural areas increases over time. This is a natural process of urbanization and the trend is likely to not only persist, but also rapidly gain momentum, exacerbating the shortage of potential workers in the agricultural sector. Today, it is the shortage of workers at enterprises and the inability to fully staff the workforce that is one of the most acute problems not only in small enterprises, but also enterprises within large agro-industrial holdings in Russia.

To demonstrate the role of agriculture in the Russian economy, consider the graph below, showing the share of agriculture in Russia's GDP over the years with dynamics.

Picture 1. The share of agriculture in gross value added in the Russian Federation, %[[2]](#footnote-2)

Agriculture accounts for a significant share of the country's GDP. The indicators remain high despite the general crises, since this industry is a cornerstone not only in the export of agricultural products directly, but also in the production of derivatives for third-party industries.

As for the overall development of agriculture in Russia, the most striking and obvious indicator of growth is the conversion of free farm land into acreage. The overall dynamics is positive due to the gradual development of such distant and suitable regions as, for example, Altai. In turn, for the transfer of land to arable land, appropriate infrastructure is needed, such as, for example, grain elevators and so on. Therefore, for ease of perception, the statistics of the total growth of arable land over time will be presented below:

Table 2. Structure and dynamics of arable land growth in Russian Federation[[3]](#footnote-3)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 2018  (th. Ha) | 2019  (th. Ha) | 2020  (th. Ha) | 2021  (th. Ha) | 2021 to 2020 | |
| % | +/- |
| **The entire acreage** | **79 634** | **79 888** | **79 948** | **80 437** | **100,6** | **489** |
| **Cereals and**  **legumes – total** | **46 339** | **46 660** | **47 900** | **47 006** | **98,1** | **-894** |
| winter and spring wheat | 27 264 | 28 092 | 29 444 | 28 802 | 97,8 | -642 |
| winter and spring rye | 980 | 850 | 982 | 1 037 | 105,6 | 55 |
| corn for grain | 2 452 | 2 593 | 2 855 | 2 954 | 103,5 | 99 |
| millet | 260 | 393 | 446 | 295 | 66,1 | -151 |
| buckwheat | 1 045 | 811 | 873 | 981 | 112,4 | 108 |
| rice | 181 | 194 | 197 | 190 | 96,4 | -7 |
| legumes | 2 754 | 2 164 | 1 960 | 2 065 | 105,4 | 105 |
| **Flax** | 44,8 | 49,7 | 52,6 | 39,7 | 75,5 | -12,9 |
| **Sugar beet** | 1 127 | 1 145 | 926 | 1 004 | 108,4 | 78 |
| **Sunflower** | 8 160 | 8 584 | 8 545 | 9 753 | 114,1 | 1208 |
| **Spring rapeseed** | 1 387 | 1 357 | 1 181 | 1 409 | 119,3 | 228 |
| **Winter rapeseed** | 189 | 191 | 307 | 276 | 89,9 | -31 |
| **Soy** | 2 949 | 3 079 | 2 858 | 3 068 | 107,3 | 210 |

As mentioned above, the overall dynamics of the development of land suitable for agriculture in Russia remains extremely positive, but the increase in the amount of arable land does not mean an increase in labor productivity growth. It has already been indicated above a decrease in the percentage of people living in rural areas, which leads to a limited production capacity of each individual agricultural enterprise. An acute shortage is observed both among ordinary machine operators and other specialties, as well as highly qualified specialists among enterprises operating in the field of agriculture. The above can reduce the external factors affecting the specific yield, in other words, the production efficiency of land in the location of enterprises. Their shortage is reflected in the average yields across the fields. The statistics are presented below:

Table 3. Gross harvest of agricultural crops in farms of all categories[[4]](#footnote-4)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **2018**  **(th. t)** | **2019**  **(th. t)** | **2020**  **(th. t)** | **2021**  **(th. t)** | **2021 to 2020** | |
| **%** | **+/-** |
| **The entire acreage** | 113 255 | 121 200 | 133 463 | 121 397 | 91,0 | -12066 |
| winter and spring wheat | 72 136 | 74 453 | 85 894 | 76 057 | 88,6 | 9837 |
| winter and spring rye | 1 916 | 1 428 | 2 378 | 1722 | 72,4 | -656 |
| corn for grain | 11 419 | 14 282 | 13 879 | 15 240 | 109,8 | 1361 |
| millet | 217 | 440 | 396 | 368 | 92,9 | -28 |
| buckwheat | 932 | 786 | 892 | 919 | 103,0 | 27 |
| rice | 1 038 | 1 099 | 1 142 | 1 076 | 94,3 | 66 |
| legumes | 3 436 | 3 344 | 3 447 | 3 839 | 111,4 | 392 |
| **Flax** | 37 | 38 | 39 | 26 | 66,1 | -13 |
| **Sugar beet** | 42 066 | 54 350 | 33 915 | 41 202 | 121,5 | 7287 |
| **Sunflower** | 12 756 | 15 379 | 13 314 | 15 656 | 117,6 | 2342 |
| **Spring rapeseed** | 1 989 | 2 060 | 2 572 | 2 794 | 108,6 | 222 |
| **Winter rapeseed** | 4 027 | 4 360 | 4 308 | 4 760 | 110,5 | 452 |
| **Soy** | 22 395 | 22 075 | 19 607 | 18 296 | 93,3 | -1311 |

The statistics presented above are necessary to calculate such an indicator as the average yield for each of the presented crops by year:

Table 4. Average crop yield[[5]](#footnote-5)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **2018**  **(Ha/t)** | **2019**  **(Ha/t)** | **2020**  **(Ha/t)** | **2021**  **(Ha/t)** | **2021 to 2020** | |
| **%** | **+/-** |
| **The entire acreage** | 25,4 | 26,7 | 28,6 | 26,7 | 93,4 | -1,9 |
| winter and spring wheat | 27,2 | 27,0 | 29,8 | 27,2 | 91,3 | -2,6 |
| winter and spring rye | 20,0 | 17,3 | 24,4 | 17,2 | 70,5 | -7,2 |
| corn for grain | 48,1 | 57,0 | 50,8 | 52,5 | 103,3 | 1,7 |
| millet | 11,6 | 12,5 | 11,0 | 13,6 | 123,6 | 2,6 |
| buckwheat | 9,5 | 10,0 | 10,9 | 10,0 | 91,7 | -0,9 |
| rice | 57,6 | 57,6 | 58,3 | 57,8 | 99,1 | 0,5 |
| legumes | 13,0 | 16,1 | 18,1 | 19,1 | 105,5 | 1 |
| **Flax** | 8,7 | 8,7 | 8,6 | 7,1 | 82,6 | -1,5 |
| **Sugar beet** | 380,6 | 479,6 | 370,0 | 414,6 | 112,1 | 44,6 |
| **Sunflower** | 16,0 | 18,3 | 15,9 | 16,2 | 101,9 | 0,3 |
| **Spring rapeseed** | 12,4 | 13,2 | 16,3 | 15,1 | 92,6 | -1,2 |
| **Winter rapeseed** | 19,8 | 22,6 | 23,0 | 26,9 | 117,0 | 3,9 |
| **Soy** | 14,7 | 15,7 | 15,9 | 15,9 | 100,0 | 1 |

The table above shows the generalized average efficiency of agricultural enterprises in Russia. The negative trends that can be observed in almost all major crops are the result of a number of factors. Although the agricultural industry is extremely dependent on such uncontrolled factors as the general state of the environment, soil composition and weather conditions, the influence of a number of these factors can and should be offset by adapting to conditions, competent planning and using available methods and techniques to increase the efficiency of work performed. Further, in the statistics, let's consider how enterprises in the agricultural sector are able to function under the negative conditions demonstrated above. Due to the large volume of statistical data, the table will be displayed in the appendix to this work.

Picture 2. The share of profitable and unprofitable organizations in their total volume, %[[6]](#footnote-6)

As can be seen from the above table and graph, the proportion of profit-making organizations remains at a high level, but is achieved by reducing the total number of operating organizations. It is mainly the small sector that suffers, in other words, local enterprises that arose on the basis of the production capacities of former collective farms. The reduction in the number of enterprises shows great difficulties in the systematic and rapid development of this sector of the economy.

Small-scale enterprises, in many ways, survive due to government subsidies and special credit programs. For example, if we take into account the enterprises of the Nizhny Novgorod region, namely the Gaginsky district, we can observe a high importance in the modernization of basic equipment due to subsidies.

According to the average data received from the directors of three agricultural enterprises, during the period from 2012 to 2022, modernization was carried out twice and financed by 63.8% at the expense of state support. The reality of agricultural enterprises is that only enterprises within large agronomic holdings such as Miratorg and Avangard Agro are able to fully support themselves while remaining profitable.

However, even such giants are not the main sources of investors' profits. For example, that de Avangard Agro is not a priority company in the founder's portfolio, giving way to financial organizations. This is one of the factors holding back the rapid growth of the agricultural industry. The lack of investment attractiveness leads to moderate interest from potential investors and, as a result, a lack of adequate financing to unlock the potential of the industry. The structure of legal forms among the total number of operating enterprises in the field of agriculture is shown below:

Picture 3. The structure of agricultural organizations by forms of management, %[[7]](#footnote-7)

The vast majority of the percentage remains with Limited Liability Companies and remains at the level of 63.5%. As you can understand, these are small enterprises, the main producer and main consumer of state support for agriculture, that is, subsidies. Public joint-stock companies occupy the 5th position and account for 1.3% of the total, ahead of only state-owned enterprises, whose share is 1.2% of the total. It is public joint-stock companies that are characterized by competent production planning, the availability of capital for development and the ability to carry out not only the cultivation of crops, but also their further processing into a finished product.

It is necessary to mention the main problems that small agricultural enterprises face on the way to successful development and which can be solved by introducing point agriculture technologies with the use of modern computer technologies. In other words, one of the secrets of successfully increasing the efficiency of work performed among the giant enterprises of the agronomic sector and describe what it can introduce to the enterprises. Today, these tools are still relevant, but their potential has almost reached the limit possible at the current level of technology development. At the same time, new tools have appeared that were previously unavailable. In particular, satellite and computer technologies that have become publicly available. Today, these tools are still relevant, but their potential has almost reached the limit possible at the current level of technology development. At the same time, new tools have appeared that were previously unavailable. In particular, satellite and computer technologies that have become publicly available.

Precision farming is a crop productivity management system based on the use of a complex of satellite and computer technologies. Instead of plowing, sowing and fertilizing "by eye", as was done throughout the previous history of agriculture, today farmers can accurately calculate the amount of seeds, fertilizers and other resources for each section of the field with an accuracy of up to a meter. After drawing up an accurate field map based on satellite and laboratory data, indicating the characteristics of each site, the farmer will be able to allocate resources more efficiently between them. This way you can avoid overspending resources where they are eating.

Now, let us look at the management structure of the enterprise and, as a result, the work. The main person in this case is the director of the enterprise, who, in view of the specifics of management, must have expertise in both human resources and sales, as well as equipment and work processes. In other words, the director, as a connecting link, must know both all the work at the enterprise and the device and technical condition of each equipment and employees.

The scheme below clearly shows the importance of the director's role.

Director

Engineer

Accountant

Agronomist

Profile employee

Mechanic, handyman

Purchasing Officer (if there is one in the company)

Picture 4. The scheme of managerial interaction at an agricultural enterprise[[8]](#footnote-8)

The director, in order to make a decision, needs to consult with agronomists to discuss the possibility of carrying out work on the part of weather conditions and plant seasonality, soil condition and other conditions. Next, get an opinion from an engineer and make sure that the necessary equipment is in proper condition and with its help you can start work. By combining these data, the director must check the availability of the necessary materials and the willingness of employees to carry out both the work itself and the supervision of these works. The diagram clearly demonstrates the chain of interaction. Unlike classical management schemes, an agricultural enterprise differs in the absence of full delegation of interaction from the director. he needs to be aware of and in contact with all structures of the enterprise on a daily basis for competent management and planning of activities.

Having determined the conditions in the market, we can conclude that there is a ready market for the introduction of new software that will significantly simplify the management process at the enterprise. Let's look at the analysis of the strengths and weaknesses of a startup:

Table 5. SWOT analysis of a startup product[[9]](#footnote-9)

|  |  |
| --- | --- |
| Strength | Opportunities |
| - The lack of analogues in the free market  - An open need for a product  - Prepared infrastructure  - There is no need for direct production | - Combining enterprises into a single network  - Cooperation with Rosstat  - Creation of an agronomic exchange  - Refinement and extension to other industries |
| Weaknesses | Threats |
| - The high role of human resources for data entry  - The need to enter into contracts with third-party manufacturers  - High price for the initial connection  - Field service | - Conservative rejection  - Damage by employees of the company  - Failure of the contract for the supply of sensors  - Stability of the Internet connection in fields |

1. Strength

The strengths are very obvious. Such programs have been on the market for a long time, but their functionality can be very limited or narrowly focused, which makes them a feature of large agronomic holdings. Each of these programs is developed strictly personally and cannot be adapted to other enterprises. All this makes the market completely empty. Along with the above-mentioned features of the industry, which the product is designed to solve, this provides a high chance of successful launch.

2. Opportunities

As for the features, all of them are somehow related to the functionality of the program and its further refinement. Firstly, with a high number of connected enterprises, it is possible to unite all enterprises into a single network, reflecting a complete statistical interactive map, which, in the future, may simplify the interaction between enterprises that takes place. Further, this will make it possible to become a tool for compiling statistics for Rosstat and the Ministry of Agriculture. This, in turn, will increase the social value of the product, which can significantly increase the sales market. Along with these, it will be possible to create an analog of the exchange for agricultural products and shift it from the classical market, which is the agricultural industry.

3. Weaknesses

Weaknesses partly stem from strengths. The lack of direct production of the components of the system leaves the need for cooperation with third-party companies. Mediation may fail at the moment and cut off supplies, which will prompt the search for analogues and the repetition of the process. Also, the purchase price increases the initial cost of preparing the system for the client, which may scare off a potential partner..

4. Threats

The threats of the product have the opportunity to seriously slow down the integration of the program into the market. This is primarily due to the conservatism of agriculture. Abrupt changes and additions of control over each of the processes during the entire work execution process may not appeal to both the company's employees and management. Clear, predictable figures will be needed to convince the management team of the real benefits that the product can bring.

However, this is not a guarantee, because, in the future, the management itself may face a protest from employees in view of their indignation about increased control. Intentional sabotage of the system is a real threat, the elimination of which directly depends on the management of the enterprise.

**ПРО ТЕХНОЛОГИЮ**

Let's take a closer look at precision farming technologies and how exactly a linking program can assist in the management of an agricultural enterprise.

What exactly is farming in principle? Precision agriculture is a comprehensive high–tech agricultural management system that includes global positioning technologies (GPS), geographic information systems (GIS), yield assessment technologies (Yield Monitor Technologies), Variable rate Technology, remote sensing of the earth (remote sensing) and aimed at obtaining the maximum amount of high-quality and cheapest agricultural products, taking into account environmental safety standards.

The concept of Precision Farming technology appeared back in 1980 in the USA. At that time, specialists began to make the first maps on differentiated fertilization based on soil analyses. This technology has become widespread only in the last five years - this has been facilitated by the development of mobile technologies, high-speed Internet and the availability of satellite images.

How does Precision farming technology work? The basis of data analysis is often satellite images (it is also possible to obtain images by flying around the field on a drone). Images with a resolution of 10 meters are suitable for the possibility of analyzing the state of the fields, so there is no need for high-precision photographic equipment. One of the founders of precision farming methodology, Dr. P. Robert V. 1994 defined it as an agricultural management system based on information and technologies for identification, analysis and management, taking into account differentiated spatial and temporal soil variations in a particular field, to optimize costs, increase the sustainability of agrocenoses and environmental stability of production. The main goal of precision farming in the production of crops is to maximize yields, financial benefits and minimize capital investments and environmental impacts.

The basis of the scientific concept of precision agriculture is the idea of the existence of heterogeneities within a single field. To assess and detect these inhomogeneities, the latest technologies are used, such as global positioning systems (GPS, GLONASS), special sensors, aerial and satellite images, as well as special programs developed for agricultural management. The data obtained are used for crop planning, calculation of fertilizer application rates and plant protection products, more accurate yield prediction and financial planning.

Advantages of precision farming:

* Optimization (minimization) of the cost of raw materials — fuel, seeds, fertilizers, water, etc.
* Increasing the yield of the fields used.
* Improving the quality of the products received.
* Improving the quality characteristics of the land used.
* Reducing the negative impact on the environment.

Disadvantages of precision farming:

* High cost.

The introduction of these technologies requires considerable funds, which most agricultural enterprises already lack. Even with a good payback, not every farm can afford precision farming technologies.

* Technical complexity.

It is about modern ultra-sophisticated computer technologies. In rural areas, it is not so easy to find specialists who are able not only to implement, but at least to maintain precision farming system devices.

* Lack of practical experience.

Almost all precision farming technologies are completely new. In addition, they are changing and improving rapidly. Such rapid technological progress means that there is not enough practice in their application, and therefore it is impossible to adequately assess the effectiveness of their use in certain conditions

Nevertheless to say, these disadvantages cannot be considered a significant reason for abandoning the use of precision farming in principle. It is obvious that the future belongs to it, and those enterprises that master these technologies earlier will gain significant advantages in the competitive struggle for the markets of their products.

The main difficulty lies in the lack of software on the market that makes the use of the above technologies simple and understandable. There is no intermediary company between representatives of manufacturers of such engineering solutions and, directly, agricultural enterprises. The market needs an affordable tool to combine the entire economy into one single program that allows an employee with minimal training to track the progress and quality of all work, competently plan the organization's activities in advance and maximize the effectiveness of available resources to increase overall efficiency and, as a result, improve the financial performance of the enterprise. The above will not only increase the liquidity of the enterprise, but also, potentially, increase the investment attractiveness of the company, which can lead to the development of not just the company, but also the entire agricultural industry in Russia.

ПРО ПРОГРАММУ

The main difficulty of the program will be directly related to obtaining the initial data for subsequent calculations. Balancing between maximizing production efficiency and monetary costs, an optimal balance was found between manual data entry and information that comes from sensors. For example, for full automation of data entry on all material resources entering the warehouses of an agricultural enterprise and being released from the warehouse for field work, an unnecessarily complex system of internal barcodes will be required, which will not only entail additional costs, but also time costs on the part of the company's employees.

In order to avoid this, it is necessary to introduce an additional position of a general accountant within the enterprise, an employee whose main duties will include collecting and manually entering information about the movement of material assets in the enterprise, creating and correcting planned and ongoing work, as well as overseeing the implementation of all these processes. Despite the allocation of a separate position, this will at least reduce the waste of material resources, relieve some of the work responsibilities from such positions as agronomist and engineer.

Summarizing the above-mentioned division of responsibilities with other positions of the enterprise, as well as separate control, we can conclude that the new employee is of undeniable benefit. The rest of the data on the performance of the work will be sent to the program from sensors installed on machinery and other equipment in the agricultural enterprise. As the main such indicators, the following can be noted: meteorological data from weather stations, fuel level in agricultural machinery and tanker cars, the level of material assets on trailed equipment (seeds, grain, fertilizers), data from electronic scales, GPS tracks, the state of operation of trailed equipment, geodata of fields, routes of equipment, the area of work carried out within the framework of fields. The above will be presented to the accounting operator in the form of an interactive map and a general menu with various sections. The following sections will be presented in these menus:

* Warehouse
* Machinery and combinations
* Fields
* Works
* Employees
* Waypoints
* Tasks

Next, we will look at each of these sections in detail and with an explanation of the purpose of each of them. The illustration is presented in the appendix \_\_

**Warehouse**

The warehouse section is a list of all storage facilities available to the enterprise with a list of material assets located in it. At the same time, it does not matter what type of material assets are in storage, everything will be stored in the database. The final view will be a menu section with a list of structures used for storage. In this menu, in turn, the sections “Control” and “Material values" will be presented.

The “control” tab is designed to store data from inspections of the warehouse with photos or video footage of the inspection. Parameters such as the general condition of the structure, the presence of leaks, and so on will be presented for easy access so that the inspector can quickly track changes and analyze what type of material assets can be stored there. The next subsection is “material values". Accordingly, it will provide information about the stored resources. Spare parts or agricultural products do not matter, because the program is adapted to account for both. The differences will be in the units of measurement.

**Machinery and combinations**

One of the most interesting and useful sections. The company's employees will have the opportunity to record and store in advance the various combinations of equipment and trailed or mounted equipment used. In other words, statistics on combinations of equipment will be available to the management staff, that is, its efficiency, permissible operating speeds, passport performance and fuel consumption under different operating modes. These data are necessary for a more convenient, fast and detailed calculation of the most effective combinations for a particular type of work performed, which will reduce the associated costs caused by the irrational use of combinations of equipment.

**Fields**

This section is necessary, first of all, for the agronomists of the enterprise. In this section, in addition to the general list of fields, historical information will be presented, containing data such as a list of completed works by season and year, phenological observations of fields, and so on. An employee of the enterprise can check at any time which crops were grown in the field in previous years to develop a further sowing plan. Also, information will be provided about the type of soil, field measurements and the reasons for over-measurements, the yield of previously planted plants, and so on. In other words, a section aimed at simplifying the long-term planning of both seeding and ongoing work. The directors, in turn, can look at the historical information on the yield of certain crops for a potential calculation of sales and revenue.

**Works**

This section will contain all the types of work that the SHP can perform. This section has rather an auxiliary function. This is a kind of reference book. It will indicate the sequence of works, seasons and months for their completion. The main use of this section is to provide a database of ready–made templates for creating tasks in the following sections.

**Employees**

An auxiliary section that provides information on how many and which employees are present in the company. It contains information about which types of work were more often involved and the categories of driver's licenses they have.

**Waypoints**

An auxiliary section created mainly for cargo transportation. In other words, pre–set routes for the equipment, which will be selected in one of the following sections to maximize the cost of time and fuel.

**Tasks**

Let's look at this section in more detail. This section is the main working window for the employee of the enterprise responsible for control. This section will reflect a general map of the area with a display of all the objects of the enterprise, such as bases and fields. It is in this section that the task for machine operators and other employees of the enterprise will be formed. The controlling employee will be able to select the necessary positions from the above-mentioned sections so that a work plan is created in the program. When creating the work, the employee will choose an agricultural crop, the type of work being carried out, a combination of equipment, an employee and the field where the work will be performed. Based on the selected data, the program will mark the target field on the interactive map, tracking of the equipment will begin and the route of the equipment will be extended. Along with this, according to the template, the program will independently prepare a waybill and give an estimated calculation of fuel and material resources (seeds, fertilizers, chemicals and others). All that remains is to monitor the progress of work and identify deviations from the set plans for further analysis.

To simplify the perception, it would not be superfluous to bring work with the program:

The working day at the enterprise on the part of the management team will be to create works. The employee will receive a notification about the weather data and the appropriate deadlines for the work. For example, consider sev. In this case, there is a consumption of not only fuel, but also seeds for sowing. The employee will select from the general list of fields the one on which the work will be performed. Next, the program will provide you with a list of possible types of work, from which the planned one will be selected. Next, all combinations of equipment suitable for this work with current weather data will be presented, sorted by maximum efficiency (calculation of performance indicators and fuel costs, the cost of paying the mechanic). Having selected everything necessary, a list of machine operators suitable for the selected technique will be displayed, which, at the time of work, will not be involved in third-party tasks. Having chosen a mechanic, and having received a prepared waybill, the employee will only have to observe the progress of the work.

The above is necessary, first of all, to control costs. Based on the data, it will be possible to analyze, for example, the reasons for the overspending of top equipment. Conditionally, the company has the opportunity to track whether fuel overspending is the result of malfunction, unprofessionalism, inefficient use of a combination of equipment, theft, and so on. A large number of such moments are provided to help identify the most cost-effective and efficient method and means for performing production processes. In total, all these points help to reduce costs in an agricultural enterprise by at least 20% when analyzing the impact of point farming in enterprises that have implemented these innovations in their work processes.

It is also important to contribute to the data obtained during long-term planning. For example, an enterprise can use all the information provided, such as the work performed and compliance with all standards, to predict the quality class of the resulting crop and its potential volume, which will allow more competently distributing sales in future periods and, potentially, to obtain the opportunity to create supply contracts for the future.

**ПРО СТАРТАП**

In this part we would like to present investment analysis of our company. As it was mentioned before, we will suffer losses for the first year and for second, below we can see that table of our cashflows.

Table 5. Free Cash Flow[[10]](#footnote-10)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year | 2025 | 2026 | 2027 | 2028 |
| Free cash flow | -7 250 897 | -2 736 648 | 7 585 167 | 21 461 585 |

This situation will occur because we will have to develop for the first years and try to prove that our product worth attention and effective. Once it will be proven, we can expect stable growth of number of customers and revenue. We will hire new employees.

We will receive preferential loan for 5 million rubles with interest of 5%, since there is a special program aimed at support of IT companies which implement digitalization in different spheres of economics. Our equity will be our own money – 2.4 million rubles, what makes our weight of debt approximately 70% and weight of equity – 30% at the start. We assume that average price of subscription, what includes technical support and consultations related to our sensors and software of 80 000 rubles and price of installation – 180 000 rubles. Our revenue projections are that in the first year we will get 6 users, 22 more users in the following year, 28 in the third year and 29 in the last one.

Such model shows that we will be able to generate stable positive monthly income only in the beginning of third year and we will use our loan an own money to continue operating.

For the balance sheet, we will have 4.4 million rubles of assets which include: 2 million rubles – software, 2.1 million rubles – cars for the delivery, installation and maintenance of our sensors and the whole system, 200 thousand rubles for office supplies and 100 thousand rubles for miscellaneous. Depreciation of assets will be straight forward and calculated for 72 months. Cash and cash equivalents will be negative in the first year. Uncovered losses are estimated to be about 3.5 million rubles in the end of the first year.

To start with our analysis, it is worth to present WACC and its calculation. The weighted average cost of capital (WACC) of a company is the total cost of capital from all sources combined, including debt, preferred shares, and common shares. Each capital type's cost is divided into equal parts according to its percentage of total capital, and the total cost is then added.

Изображение выглядит как текст, снимок экрана, Шрифт, Прямоугольник

Автоматически созданное описание

Picture 5. Weighted average cost of capital calculation[[11]](#footnote-11)

WACC is an average cost of capital that is calculated as weight of equity multiplied by cost of equity plus weight of debt multiplied by cost of debt and multiplied by tax shield which is calculated as one minus effective tax rate. In our model we have the following numbers:

Table 6. WACC calculation [[12]](#footnote-12)

|  |  |
| --- | --- |
| **WACC calculation** |  |
| Weight of debt | 0,70 |
| Weight of equity | 0,30 |
| Cost of debt | 5% |
| Cost of equity | 17,35% |
| WACC | 9% |

In our model WACC is 9% what means that means the company must pay an average of $0.09 to source an additional $1 and our company should provide internal rate of return more than 9% to be profitable.

Table 7. Main investment indicators.[[13]](#footnote-13)

|  |  |
| --- | --- |
| **Indicator** |  |
| NPV rub | 4 822 749 |
| IRR | 56% |
| MOIC | 1,96 |

Net present value is the sum of all cash flows over estimated period that is discounted to the present. In our case discount rate is our WACC – 9%. If net present value is positive, project can be considered profitable, our company got NPV of 4.8 million rubles, what means that company will bring our investors this profit even with discounting of their money.

Internal rate of return is the rate that will bring our future cash flows to zero, this is the maximum discount rate that project can take without losses, we have IRR of 56% what is considered to be high in many industries, including IT. With this IRR we can say that project is safe, and our investors’ money will not be lost. Even though we do not have competitors on the market yet, we would say that 56% is a number that is attractive and hard to be reached.

Another investment indicator is multiple of invested capital. Basically, this is how many times more projects will bring from the initial investment. This indicator in our model is almost 2, what means that project will generate twice more money that there will be invested.

All in all, our start up is profitable and safe, idea is new and aimed to solve problems of agricultural sector and improve its efficiency. Main factor that allowed these indicators to be that attractive is that we have a loan with interest rate of 5%, what will allow us to make this hard start and continue with generating profit, develop this project and extend to the other markets. It is expected that after fourth year company will continue to growth and all the subscriptions will continue to generate profit.

1. According to the All-Russian Population Census [↑](#footnote-ref-1)
2. Complied by author on the basis of All-Russian Population Census [↑](#footnote-ref-2)
3. According to the consolidated reports of the Ministry of Agriculture of the Russian Federation on the financial and economic condition of agricultural producers receiving state support from the federal budget. [↑](#footnote-ref-3)
4. According to the consolidated reports of the Ministry of Agriculture of the Russian Federation on the financial and economic condition of agricultural producers receiving state support from the federal budget. [↑](#footnote-ref-4)
5. Complied by author on the basis of the consolidated reports of the Ministry of Agriculture of the Russian Federation on the financial and economic condition of agricultural producers receiving state support from the federal budget. [↑](#footnote-ref-5)
6. Compiled by the author based on the summary reports of the Ministry of Agriculture of the Russian Federation on the financial and economic condition of agricultural producers receiving state support from the federal budget [↑](#footnote-ref-6)
7. Compiled by the author based on the summary reports of the Ministry of Agriculture of the Russian Federation on the financial and economic condition of agricultural producers receiving state support from the federal budget [↑](#footnote-ref-7)
8. Compiled by the author based on the experience of interaction with the management of an agricultural enterprise [↑](#footnote-ref-8)
9. Complied by author on the basis of the developed data [↑](#footnote-ref-9)
10. Complied by author on the basis of the developed data [↑](#footnote-ref-10)
11. WACC calculation URL: <https://corporatefinanceinstitute.com/resources/valuation/what-is-wacc-formula/>(access date 12.05.2024) [↑](#footnote-ref-11)
12. Complied by author on the basis of the developed data [↑](#footnote-ref-12)
13. Complied by author on the basis of the developed data [↑](#footnote-ref-13)