Project of a vertically integrated commercial dairy facility in the Voronezh Region for 2,400 milk cows

Business Plan

The project is initiated by: Khokholskaya Agricultural Company, LLC

Moscow, 2016
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## 1. Project Summary

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<th>Project Concept</th>
<th>The project stipulates a commercial dairy facility (CDF) to be constructed for 2,400 milk cows with a capacity of 50 t milk per day and 140 jobs to be created.</th>
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<tbody>
<tr>
<td></td>
<td>The facility shall include:</td>
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<tr>
<td></td>
<td>- a milk dairy farm for 2,400 milk cows, 2,300 animals of growing stock, 290 feeder male calves;</td>
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<tr>
<td></td>
<td>and also:</td>
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<tr>
<td></td>
<td>- a mixed fodder plant with a capacity of 10 t/h of non-packed mixed fodder;</td>
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<tr>
<td></td>
<td>- a grain elevator with a simultaneous storage capacity of 34 thousand tons of grain;</td>
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<td></td>
<td>- a farm machinery depot (FMD), agri-business equipment and vehicles.</td>
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<td></td>
<td>About 7,000 ha of land, mostly belonging to the agricultural land category, will be used to produce mixed fodder.</td>
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<td>The commercial dairy farm (CDF) shall include: 8 buildings for livestock breeding; 2 milking halls; a site infrastructure, roads and manure lagoons.</td>
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<td></td>
<td>The CDF includes a production, veterinary, feed areas, sites for manure storage, engineering supply facilities, road network and amenities. The total area of the farm with the infrastructure will amount up to 41 ha.</td>
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<tr>
<td></td>
<td>The second stage is planned to be implemented in the future, upon completion of the planned investment program of the Project, including an increase in the livestock by half to 4,800 animals of the milk cattle with a daily production capacity of up to 100 tons of milk, the development of milk processing and its own sales network. It stipulates the creation of additional 180 jobs.</td>
</tr>
</tbody>
</table>

| Current status of the project | Currently, the project is at a pre-investment stage, with the following phases completed: 1. A positive opinion of a non-state examination is obtained. Managing Company Zhilproekt LLC for the CDF facility 2. An expert opinion on the Project by a specialized R&D institute is obtained. 3. A non-state examination of the following facilities: power supply system, farm machinery depots, a gas pipeline, a reconstruction of the grain elevator, a mixed fodder plant (the design and estimation documents are under a non-state examination) 3. Design and approval are completed in the following fields: - geological, geodetic and topographic surveys with environmental sections; - expert examination of the project; - a preliminary agreement on connection to the utility grids. - layout design of the off-site utilities (gas, power) is developed; - designs of sanitary protection zones for the commercial dairy facility, the farm machinery depot and the grain elevator with a mixed fodder plant are prepared; - data on climatic air parameters and background concentrations of pollutants are obtained from the Voronezh hydrometeorology and environment monitoring center; 4. A marketing feasibility study for sales of product is developed (Evroexpert NJSC) 5. Ruling by the Administration of Khokholsky municipal district of the Voronezh region No. 1551 dated August 27, 2014 on approving the development plan of a land plot is obtained. 6. The main project contractors are defined: - The supplier of the main process equipment - Euro-team, TTC Technology LLC (a commercial offer for the equipment supply is received); - The supplier of the equipment to the mixed fodder plant is Romax LLC (a commercial offer for the equipment supply is received); |

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The supplier of equipment to the grain elevator is VESS LLC (a commercial offer for the equipment supply is received);
• Commercial offers for supply of breeding cattle are received
• The general contractor: Construction Company VSB LLC

7. There were negotiations held, which resulted in receiving letters of intent on the possibility of financing equipment supplies by an Italian bank (Bancalmpesa Spa, Banca Monte Del Paschi Siena) and German suppliers (GEA Farm Technologies) with the participation of SACE Spa and Hermes export credit agencies.

8. Preliminary contracts for sale of raw milk for the entire volume of the production have been signed.

9. The government of the Voronezh region assigned the project the status of “especially important investment project”.

10. A three-party cooperation agreement was concluded with the Department of Agrarian Policy of the Voronezh Region and the Administration of the Khokholsky Municipal District on strategic partnership and cooperation in the implementation of the Project and providing the Initiator with up to 3,000 hectares of agricultural land for the development of the forage base.

11. The process of consolidating the property complex to be invested in the Project on the balance sheet of the Borrower is under completion.

Performance indicators

The performance indicators were calculated on the basis of the cash flow towards the investment capital. In order to bring the cash flow to the initial period of calculation, the weighted average cost of capital (WACC) was used as the discount rate.

<table>
<thead>
<tr>
<th>Key results</th>
<th>Measurement unit</th>
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<tr>
<td>Financial efficiency</td>
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<tr>
<td>Project NPV (forecast period)</td>
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<tr>
<td>IRR (forecast period)</td>
<td>%</td>
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<tr>
<td>Payback period (simple)</td>
<td>years</td>
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<tr>
<td>Payback period (discounted)</td>
<td>years</td>
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<tr>
<td>Discount rate</td>
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Project financing

The total cost of the project amounts to RUB 5,016 mn, including:
• investments in capital assets - RUB 4,939 mn;
• investments in floating assets - RUB 77 mn;

Sources of the project funding:
• own funds RUB 1,003 mn (20% of the project cost), of which RUB 670 mn is already invested to the project; RUB 333 mn - future expenses
• borrowed funds of RUB 4,013 mn (80% of the project cost); of which

Government subsidies - RUB 596 mn (refinancing of loaned funds after the facilities are entered in the Borrower's books)

Participants of the Project

The project is initiated by:
Khokholskaya Agricultural Company, LLC
SKh Company, LLC
Company KhSC, LLC

Recipient of funds: Khokholskaya Agricultural Company, LLC

Implementation strategy

Key implementation stages:

**Stage 1: Pre-investment stage (completed)**
(till December 2016)
• Negotiations and selection of counterparts;
• Development of the business plan;
• Development of design and estimation documentation of the P-stage;
- Undergoing the expert examination, obtaining a construction permit.

**Stage 2: Investment stage** (duration - 18 months)
- Start: design of facilities, fund raising, orders for equipment, provision of the construction site.
- Finish: commissioning of all facilities.

**Stage 3: Operation stage** - commissioning of the production facilities (start in September 2018)
- commissioning of the CDF, the mixed fodder plant, the grain elevator with a subsequent CDF reaching the designed capacity.

The implementation of the investment project has a positive social and economic effect:
- The investment project has national significance;
- The participation of Vnesheconombank in the project does not compete with commercial financial institutions.

The project complies with Vnesheconombank's requirements:
- the total cost is RUB 5,016 mn (the requirement of over RUB 2 billion);
- the loan amount is RUB 4,013 mn (the requirement of over RUB 1 billion);

The project is cost effective:
- Net present value (NPV) is RUB 572 mn (the requirement is >0);
- Internal rate of return (IRR) is 11.8%;
- Simple payback period (PBP) is 8.4 years;
- Discounted payback period (DPBP) is 11 years (the requirement of over 5 years).

The investment project stipulates a possibility of controlling the targeted use of funds by Vnesheconombank. The share of the Participants’ own funds in financing the capital expenditures for the project will be at least 20%.

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2. Project Information

2.1 Project Objectives and Description.

The objective of the project is to create a commercial dairy facility (CDF) in order to meet the population's demand for organic dairy products of local producers. The main task of the project after the CDF commissioning is an uninterrupted supply of raw materials (milk) to local dairy producers and wholesale buyers. When this task is completed, it will be possible to extend the range of products sold with marketable milk and dairy products.

The investment project for the CDF construction in the village of Kostyonki (Khokholsky district, Voronezh region) (hereinafter referred to as the "Project") includes erection of a number of facilities within the complex, technical connection to the power grid, gas and water supply, construction of necessary roads and access ways, and subsequent operation of the complex.

The investment phase of the Project will last 18 months and will include the following facilities:

- a farm for 2,400 milk cows, 2,300 animals of growing stock, 290 feeder male calves, with a daily milk production capacity of 50 tons;
- a grain elevator with a simultaneous storage capacity of 34 thousand tons of grain;
- a mixed fodder plant with a capacity of 10 t/h;
- a farm machinery depot (FMD), with an agri-business vehicle park

Available land resources:

3,668 ha of agricultural land owned by the project initiators;
1,300 ha of agricultural land leased;
3,000 ha of agricultural land (planned to be leased additionally for the project upon agreement with the government of the Voronezh region).

The following buildings and structures are planned in the scope of the commercial dairy farm:

- 1 maternity and dry-keeping building (222 m x 33.8 m);
- 3 cattle houses for the main cattle (198 m x 33.8 m);
- 1 milking parlor (72 m x 30 m) with the rotary milking installation;
- 1 small milking parlor (30 m x 14 m) with herringbone milking stalls;
- 2 sheds for calf boxes (90 m x 30 m);
- 1 calf house for 3-6 months calves (126 m x 28 m);
- 2 calf houses for 6-15 months calves (126 m x 30 m);
- 2 buildings for bred heifers (126 m x 33.8);
- 9 crossway galleries (6m x18m).

Upon the implementation of the investment program and reaching the designed capacity, it will be possible to increase the milking stock by half to 4,800 heads with the corresponding expansion of the CDF and increase a capacity to 100 tons of milk per day. Commissioning of new production facilities will be effective at this stage, as well as the commissioning of product processing lines with a capacity of 100 tons of milk per day with the production of ready-made dairy products.

Advantages of the project

- The project stipulates implementation of intensive innovative technologies for livestock and crop production, designed layout and process solutions for year-round stable keeping of cows with silo concentrated forage in compliance with the world's best practices, which will contribute to an increase in dairy cattle productivity.
• Reduction of the deficit of raw milk in the market: according to the target indicators of the Russian food security doctrine, the availability of own resources should be at least 80%, with a current actual supply of consumption in the Central Chernozem region by own production not exceeding 75%;

• A potential market share is due to the import substitution. The import share in the Russian market: 22-30% for milk (various estimates), 30% for beef. These are essentially potential niches for import substitution by the Russian companies;

• Vertical integration. The integration of own lands for growing fodder, a mixed fodder plant, a grain elevator and CDF in a single complex makes the production cheaper. A subsequent deepening of integration with a construction of a milk processing plant will further increase the competitive advantages;

• Shortage of grain elevator facilities. The shortage of grain elevator capacity in the Voronezh region is 40%, which gives a constant load for one’s own grain elevator;

• State support:
  - subsidies at the federal and the regional levels for animals and milk;
  - a partial reimbursement of capital expenditure for construction of commercial dairy facilities and engineering utilities of the project;
  - reimbursement of the interest rate at the federal level, reimbursement of the cost of financial resources at the regional level;
  - discount prices for fuel and lubricants, fertilizers and seeds.

• The project will contribute to the social and financial development of Khokholsky municipal district and the entire Voronezh region. About 140 jobs with an average salary of over 30 thousand rubles will be created in a manpower-surplus agricultural region within the first stage of the Project. More than 400 million rubles of taxes and social contributions will be transferred to budgets of all levels and off-budget funds.

2.2 Information about the main participants of the Project

The project is initiated by:

1. Khokholskaya Agricultural Company, LLC
2. Company KhSC, LLC
3. SKh Company, LLC

The project initiator and the recipient of funds is Khokholskaya Agricultural Company, LLC (hereinafter referred to as the Company), which was established in August 2006 (the successor of Khokholskaya Agricultural Company, CJSC) to produce grain and industrial crops.

At the moment, the Company has 3,630 ha of agricultural land on its balance sheet, including 3,079 ha of arable land and 551 ha of pastures, with 1,300 ha of land leased, and also a milking herd with an average annual number of 250 animals. By the beginning of the investment phase of the Project, several real estate facilities (currently registered on the balance of two other initiators) will be consolidated on the balance sheet of the Company, including a grain elevator with a simultaneous storage capacity of 34,000 t, and farm machinery depot facilities. In the course of the project implementation, arable land will be increased to 7 thousand ha.

The company employs qualified specialists with extensive experience in agriculture.
1.1. Productive livestock

The most common cattle breed in the world, due to its excellent milk productivity, namely Holstein black and white, will be used at the CDF.

### Table 1

<table>
<thead>
<tr>
<th>Breed</th>
<th>Fat</th>
<th>Protein</th>
<th>Lactose</th>
<th>Ash</th>
<th>Total dry matter</th>
<th>Nonfat milk solids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ayrshire</td>
<td>4.1</td>
<td>3.6</td>
<td>4.7</td>
<td>0.7</td>
<td>13.1</td>
<td>8.52</td>
</tr>
<tr>
<td>Brown Swiss</td>
<td>4.0</td>
<td>3.6</td>
<td>5.0</td>
<td>0.7</td>
<td>13.3</td>
<td>8.99</td>
</tr>
<tr>
<td>Holstein</td>
<td>3.7</td>
<td>3.1</td>
<td>4.9</td>
<td>0.7</td>
<td>12.4</td>
<td>8.45</td>
</tr>
<tr>
<td>Jersey</td>
<td>5.1</td>
<td>3.9</td>
<td>4.9</td>
<td>0.7</td>
<td>14.6</td>
<td>9.21</td>
</tr>
</tbody>
</table>

Reference: Technology and Mechanization of Dairy Farming, St. Petersburg, 2010

Despite the fact that the composition of milk of Holstein cows is inferior in composition to that of other common breeds, the Holsteins are confidently ahead of the rest of the breeds in terms of the amount of produced milk. It is the reason of the breed popularity in the world, as well as the reason to choose Holsteins as the main breed for the Project.

**General characteristics of the breed:** Most Holstein cows are black and white. Red and white color is also possible, which is a recessive form. Red and white animals have been accounted as breeding livestock since 1971 being registered as a separate breed. The live weight of first-calf cows is 650 kg, that of adult animals is 750 kg. The live weight of bulls is 1,200 kg. First-calf cows are 137 cm high at the shoulder; adult animals - 143-145 cm, the chest being 80 cm deep and 55 cm high. The live weight of the bulls when they are born is 40-42 kg, that of heifers is 37-39 kg. Holstein cows have a distinct udder, and less developed muscles as compared to European black and white livestock. The cows have a bulky, broad udders, firmly attached to the abdominal wall. More than 95% of cows have a cup-shaped udder. The udder index is 48-50%, the lactation rate is at least 2.5 kg/min; preference is given to animals with a lactation rate of 3.0 kg/min or more.

Performance indicators of Holstein black and white may vary with the country, since there are significant differences in breeding purposes, climatic and fodder conditions. The highest yield of this breed is in Israel (over 10,000 kg), although fat in milk does not exceed 3-3.2%, protein being about 3%. The yield of Holstein cows in the U.S. and Canada is somewhat lower, but fat content is 3.6-3.7, protein is 3.1-3.2%.

In Russia, the breed is common in the Central, North-Western, Southern, Volga, Ural, Siberian and Far Eastern Federal Districts.

Breeding history: Pedigree heifers with an extensive breeding history. Registered in the National Herd Book.

**Age:** 18-30 months at the time of supply.

**Weight:** An average weight of at least 530 kg at the time of dispatch.

**Maternal line:** An average yield for the maternal line is at least 8,000 L per year. All lactation periods are calculated on the assumption that the period is 305 days long with fat content being at least 3.8% and protein content being at least 3.1%.
A bull is on the father's Holstein line, registered in the Herd Book, has a confirmed positive genetic index for milk. (American/Canadian line).

A bull for insemination: A registered Holstein bull with a positive genetic index for milk.

Appearance: All heifers are large and have typical Holstein characteristics: strong legs, well-developed udder and no defects. All animals have no horns.

Export certificate: All animals are accompanied by an individual certificate, including the registration number in the Herd Book and data on the genetics of the animal and its parents. All animals shall be tagged with ear clips showing the identification number and registration number corresponding to the number of the Herd Book specified in the export certificate.

3. Description of the product line

According to the Project, the main product of the CDF is raw milk of cattle, additional product is the cattle in live weight (culling of the productive livestock and fattened growing stock). Breeding heifers, not required for a replacement of own productive livestock, will be sold at the age of 27 months to third-party livestock farms.

After cooled in tanks, all raw milk received will be shipped to consumers - major dairy plants in the region.

Major consumer. The major consumers of the Company's products will be dairy and meat processing plants, primarily in the Voronezh, as well as in the Lipetsk and Belgorod regions.

Wholesale supplies of milk are planned in advance for the following customers:
- Talovsky Dairy Plant LLC, Lipetsk region (a preliminary agreement)
- Tandem-4 LLC, Voronezh region (a preliminary agreement)
- Volovsky Dairy Plant LLC, Lipetsk region (a preliminary agreement)

A retail sale at the next stage is possible within the nearest districts of the Voronezh and Lipetsk regions (within a 200 km radius) via a chain of mini-shops and convenience stores of the Project Initiator under its own brand recognized by consumers.

Product advantages for the consumer. The use of optimal agrotechnological solutions, advanced animal keeping standards, maintaining a high genetic potential of the cattle, application of optimal feeding patterns, and a strict veterinary and hygienic regime will enable us to produce food and raw materials of the highest quality. The climate and livestock welfare guarantee the products are organic.

Safety and sustainability. One of the priority tasks of the Company is to ensure biological safety. Compliance with the biological safety regulations at the farm under construction is laid in the design of livestock facilities, in their location relative to each other and the main transport routes, as well as other potential sources of pathogens. Strict regulations concerning biological safety will be observed at the livestock farm: thorough fencing of facilities, vehicle entrance and exit only through a disinfectant barrier, preventive and precautionary measures taken to exclude infectious substances entering the territory of farms, special disinfectant treatment for equipment and people performing their everyday duties. These measures will prevent pathogenic bacteria entering the livestock facilities and negatively affecting the health of animals and their performance.

The cattle production will be environmentally friendly. The CDF will be equipped with modern manure removal systems and modern technologies of disposal of fallen animals.
3.1. Milk

Characteristics of raw milk and dairy products.
Milk contains over a hundred of most valuable components; it includes all the substances necessary for the body: proteins, fats, carbohydrates, mineral salts, vitamins. These milk components are well-balanced, hence they are easily and completely digested. Since humans domesticated the cattle, the cow has become an indispensable attribute of a developing society. People are believed to have begun competing with calves for milk as early as 9,000 years BC. Milk is a very complex biological substance, it contains more than 100 thousand different molecules, each of them playing a certain role in the process of supplying nutrients and supporting the immune system. 500 liters of blood is pumped through the cow’s udder for every liter of milk produced. The presence of dairy products in the diet increases its usefulness and promotes better digestion of all components. According to scientifically justified standard, milk and dairy products should constitute one-third of the human diet (1,000 calories of the average daily human demand in food).

Milk is a source of calcium, 97% of which is absorbed by the human body. Due to this feature, which no other product has, milk becomes essential for people suffering from osteoporosis. Milk protein is digested more easily than other proteins; it promotes the production of immunoglobulins, increasing the body’s resistance to viral infections. Milk has a calming effect on the nervous system, which is due to the presence of phenylalanine and tryptophan amino acids in it. Useful properties of milk help to reduce blood pressure. Milk reduces gastric juice acidity, therefore it is a perfect remedy against heartburn, which, as a rule, is provoked by increased stomach acidity. Milk is also useful for those suffering from gastritis with high acidity, stomach ulcer, and duodenal ulcer. Milk is rich in vitamins. It has a lot of riboflavin (vitamin B2), which contributes to a comprehensive energy metabolism in the body - riboflavin has the property of transforming carbohydrates and fats into energy. Milk is good in case of migraines, severe headaches.

The chemical composition of milk varies under the influence of various factors. Its composition mostly depends on the period (stage) of the cow lactation. The cow lactation lasts about 300 days on the average. During this time, the quality of milk changes significantly at least 3 times. In the first 5-7 days after calving, the udder generates colostrum intended for the calf. Then follows the second long period, when the milk has a normal and usual composition, and finally a third period occurring 10 to 15 days before the cow drying off. The milk of that period is called “end-of-lactation milk”. The content of fat, protein and mineral substances in end-of-lactation milk is increased, and the content of milk sugar is reduced. Fatty balls become small. The organoleptic properties of milk change, too: it acquires a bitter-salty taste.

Cows of different breeds produce milk with different chemical composition. Variations in the content of dry matter are 1.3%, those for fat - 0.9%, protein - 0.6%, and in the amount of lactose - 0.5% for cows of the same breed, depending on the season, the cow’s age, its individual features and many other factors. The milk yield and the fat content of milk are increased till the sixth calving, and then decline gradually.

Fodder affects the quality of milk, cream, milk fat consistency. Hence, green grass feeds give a creamy-yellow color to milk, cream, and butter. Forage cabbage, silage, carrots and herb flour contribute to the preservation of this color of milk in winter, as well.

The specifics of production within the framework of the Project are related to constant monitoring of the livestock health, a proper care for it and provision of timely veterinary services. All these conditions will be ensured by means of using modern systems of diagnostics and prevention of livestock diseases,
gentle and competent care of the livestock, the availability of necessary mixed fodder, as well as proper storage and timely transportation of the products.

**Licensing and certification of raw milk.**

In 2008, there was adopted Federal Law No. 88-FZ "Technical Regulations for Milk and Dairy Products" dated June 12, 2008, according to which:

- A 3-grade raw milk qualification (highest, first, second) was introduced instead of the previously applied 4-grade qualification (highest, first, second, off-grade). Since the promulgation of the technical regulations, milk being off-grade as per GOST R 52054-2003 is not allowed for processing.

- The requirements for the content of microorganisms and somatic cells for the highest milk grade became stricter.

- A mandatory declaration of milk compliance with the technical regulations was introduced.

<table>
<thead>
<tr>
<th>Controlled parameter</th>
<th>Prior to the technical regulations</th>
<th>After the technical regulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualification as per grades</td>
<td>4 grades (highest, first, second, off-grade)</td>
<td>3 grades (highest, first, second)</td>
</tr>
<tr>
<td>Acidity, T</td>
<td>less than 15.99 or over 21.00 - off-grade</td>
<td>strictly from 16.00 to 21.00</td>
</tr>
<tr>
<td>Density, kg/m³</td>
<td>less than 1026.9 - off-grade</td>
<td>strictly over 1027.0</td>
</tr>
<tr>
<td>Fat mass content, %</td>
<td>not regulated</td>
<td>from 2.8 to 6.0</td>
</tr>
<tr>
<td>Protein mass content, %</td>
<td>not regulated</td>
<td>at least 2.8</td>
</tr>
<tr>
<td>Bact. exam. (total viable count) for highest grade, CFU/cm³</td>
<td>3*1E5</td>
<td>1*1E5</td>
</tr>
<tr>
<td>Content of somatic cells for the highest grade in 1 cm³, not exceed</td>
<td>5*1E5</td>
<td>2*1E5</td>
</tr>
<tr>
<td>Presence of antibiotics</td>
<td>residual amounts possible</td>
<td>not allowed (the standard to be adjusted)</td>
</tr>
</tbody>
</table>

Reference: SOYUZMOLOKO

These indicators are only possible to be achieved with the use of modern technologies throughout the entire cycle from harvesting forage to shipping milk to a processing plant.

Antibiotics for the treatment of dairy herd are used in case of respiratory and inflammatory diseases. Most cases of antibiotics getting into milk are the consequences of mastitis treatment, when the terms of milk rejection are not complied with. The terms for milk rejection vary depending on the type of antibiotic used and are specified in the user manual. The minimum rejection period for modern drugs starts from 48 hours. Compliance with the terms for rejection is the main regulation that agricultural producers must adhere to.

Milk sold in the territory of the Russian Federation is subject to mandatory confirmation of compliance with the requirements of the Federal Law by means of issuing a declaration of conformity.

The statement of milk conformity is provided by issuing a declaration of conformity on the basis of own evidence and (or) on the basis of evidence obtained with the participation of a certification body and (or) an accredited testing laboratory.

The following requirements for the quality of raw milk are applied at modern milk processing plants:
- compliance with GOST R 52054-2003 "Natural cow milk. Raw material. Technical specifications";
- GOST 13928-84 "Prepared milk and cream. Rules of acceptance, sampling methods and sample preparation for analysis ";

Milk must be whole, fresh and must meet the requirements of sanitary and veterinary regulations for dairy farms on the maintenance of milking facilities, appliances and utensils and must comply with definitions of the sanitary quality of milk.

Depending on the physical, chemical and microbiological indicators, the product is qualified to either highest, first, second and off-grade milk. Since the promulgation of the technical regulations, milk being off-grade as per GOST R 52054-2003 is not allowed for processing.

### Requirements to raw milk

<table>
<thead>
<tr>
<th>Name</th>
<th>Standard for the milk grade:</th>
<th>Reference: GOST R 52054-2003</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>highest</td>
<td>first</td>
</tr>
<tr>
<td>Body</td>
<td>Homogeneous liquid without sediment and flakes. No freezing is allowed</td>
<td>Presence of flakes, protein, mechanical impurities</td>
</tr>
<tr>
<td>Taste and smell</td>
<td>Clean, with no side smells and tastes uncharacteristic of fresh natural milk</td>
<td>A slight taste and smell of in winter-spring seasons</td>
</tr>
<tr>
<td>Color</td>
<td>From white to light cream</td>
<td>Creamy, from light- gray to gray</td>
</tr>
<tr>
<td>Bacteria content</td>
<td>1X10⁵</td>
<td>5X10⁵</td>
</tr>
<tr>
<td>Somatic cell content</td>
<td>2X10⁵</td>
<td>1X10⁶</td>
</tr>
</tbody>
</table>

The raw milk produced in the framework of the Project will correspond to the highest and the first grades according to the Technical Regulation criteria, due to the following factors:
- use of modern equipment for commercial dairy farms;
- well-developed processes: from the production of fodder and its storage to delivery of products to raw milk processing facilities;
- the use of breed livestock of highly productive Holstein breed;
- additional process advantages: milking in the parlor and instant cooling to 4 °C;
- monitoring of milk received from each cow in on-line mode and quick reaction to quality deterioration, exclusion of "substandard" milk;
- livestock feeding according to productivity groups.

Competitive advantages of raw milk within the framework of the Project:
- Quality sufficient for processing to the premium class pasteurized milk;
- Guaranteed industrial batches.


### Milk quality parameters.

According to the GOST, milk may be divided depending on raw milk into:
- natural milk;
- normalized milk;
- reconstituted milk;
- recombined milk;
- mixtures of the above.

Depending on the heat treatment, milk may be divided into:
- pasteurized;
- baked;
- sterilized;
- UHT processed;
- UHT processed sterilized.

Depending on the fat mass content, milk may be divided into:
- skimmed;
- no-fat;
- low-fat;
- classic;
- fat;
- high-fat.

<table>
<thead>
<tr>
<th>Table 4.</th>
<th><strong>Organoleptic properties of milk</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter</td>
<td>Characteristics</td>
</tr>
<tr>
<td>Appearance</td>
<td>Non-transparent liquid. For fat and high fat products a slight collection of fat is possible, if removed when stirred.</td>
</tr>
<tr>
<td>Body</td>
<td>Liquid, homogeneous, non-thick, slightly viscous. No protein flakes and accumulated fat balls.</td>
</tr>
<tr>
<td>Taste and smell</td>
<td>Characteristic of milk, with no side taste and smell, with slight taste of boiling. For baked and sterilized milk - distinct taste of boiling. For reconstituted and recombined milk, a sweetish taste is allowed.</td>
</tr>
<tr>
<td>Color</td>
<td>Uniform white, for baked and sterilized milk - with creamy shade, for skimmed milk - with a bluish shade.</td>
</tr>
</tbody>
</table>

Reference: GOST R 52090-2003

The fact content may vary considerably.

<table>
<thead>
<tr>
<th>Table 5</th>
<th><strong>Milk fat mass content, %</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter</td>
<td>Standard</td>
</tr>
<tr>
<td>skimmed</td>
<td>0.1</td>
</tr>
<tr>
<td>no-fat</td>
<td>0.3; 0.5; 1.0</td>
</tr>
<tr>
<td>low-fat</td>
<td>1.2; 1.5; 2.0; 2.5</td>
</tr>
<tr>
<td>classic</td>
<td>2.7; 3.0; 3.2; 3.5; 4.0; 4.5</td>
</tr>
<tr>
<td>fat</td>
<td>4.7; 5.0; 5.5; 6.0; 6.5; 7.0</td>
</tr>
<tr>
<td>high-fat</td>
<td>7.2; 7.5; 8.0; 8.5; 9.0; 9.5</td>
</tr>
</tbody>
</table>

Reference: GOST R 52090-2003

Requirements for the raw milk to produce pasteurized milk:
- cow milk of at least second grade as per GOST R 52054;
- whole dried milk of the highest grade as per GOST 4495;
- spray-type skimmed milk powder as per GOST R 52971;
- dry cream as per GOST 1349;
- sweet butter as per GOST 37;
- sweet butter milk with an acidity not exceeding 17T, density of at least 1,024 kg/m³, produced at the drinking milk production plants;
- potable water as per SanPiN 2.1.4.1074 (for reconstituted and recombined milk).

Due to the use of high-quality fodder and strict compliance with the process standards, the designed milk production facility will ensure that milk quality indicators will exceed the average statistical indicators.

The production of high-quality milk with minimal bacteriological contamination will allow using gentle regimes of pasteurization and therefore offering products with significantly better consumer properties to the market as compared to the mass supply. Hence, in the case of making pasteurized whole milk products from such raw milk, the products will have a 7-day storage period against 2-3 days for pasteurized milk of the mass supply. For the production of sour-milk products, such milk provides a magnificent natural taste of fresh milk in the product. For the production of cottage-cheese products and hard cheeses (in the long term), the use of raw milk with minimal values of bacterial contamination will allow achieving a normal course of the cheese ripening process and ensuring a quality level comparable to cheese imported from Europe. The designed dairy and meat facilities will be able to have most favorable conditions of working with consumers of dairy raw materials due to such characteristics.

3.2. Cattle meat

The nutritional value of meat is defined by the content of essential proteins of animal origin (11.4% - 20.8%), fats and lipids, carbohydrates, minerals and vitamins. Proteins are the most valuable in this list; the human body cannot synthesize protein and is completely dependent on its intake with food.

In addition, meat proteins not only have a well-balanced amino acid composition, but they are also the closest to the composition of amino acids of human proteins. Meat proteins stimulate human growth, puberty, digestibility of other components of food, reduce overall needs for it, and activate metabolism in the human body.

Taste and culinary qualities of meat are largely associated with the ratio of fat and protein in it. The tastiest meat is considered to have the meat-fat ratio of about 1:1.

It is important that fat is distributed between the muscle fibers ("marble" meat). Such meat is produced by specialized breeds with early maturation.

It is valued higher than the meat of adult animals due to the beef of young animals containing less fat, muscle fibers being more delicate and tender, and proteins being better digested.

Many factors influence meat productivity of the cattle: the breed, age, sex, finish, the animal productivity line, the conditions for their breeding and feeding, pre-slaughter care and slaughter methods, castration, etc.

Meat productivity indicators are as follows:
- live weight;
- dead weight;
- slaughter yield;
- ratio of muscle tissue, fat and bones in the carcass;
- quality of meat;
- value of the average daily weight gain and the fodder/gain ratio.
The ratio of muscle tissue, bones and fat in a carcass strongly depends on the finish, the productivity line and the age of animals. The mass of bones is 12-15% of the carcass mass for well-fed beef cattle, and is 18-21% for the dairy breeds. If dairy cattle being malnourished, the mass of bones in the carcass can reach 30-34%. A relative content of bones in the carcass of animals reduces with age.

Cattle licensing and certification.
The main standards applied to the cattle are as follows:

- GOST 26090-84. Cattle. Veterinary and sanitary requirements for animals and conditions of completing industrial complexes. Application. This standard establishes general veterinary and sanitary requirements for cattle supplied to industrial facilities, as well as requirements for farms supplying animals and industrial facilities.

- GOST 16020-70. Cattle for slaughter. Terms and definitions. Application scope and terms: This standard establishes the terms and definitions for the basic concepts of animal species intended for slaughter as raw materials for the meat industry used by science, technology and production.

- GOST 5110-55. Cattle for slaughter. Determination of finish. Application scope and terms: This standard is used to determine the finish of cattle and buffaloes prepared and submitted for slaughter.

- GOST R 50848-96. Requirements for growing, feeding cattle for meat to produce baby food. Standard process.

In accordance with GOST 26090-84 "Cattle. Veterinary and sanitary requirements for animals and conditions of completing industrial complexes", farms supplying animals shall be safe in terms of animal infectious diseases.

- GOST 5110-55 "Cattle for slaughter. Determination of finish" is used to determine the finish of cattle prepared and submitted for slaughter.

Determination of finish. Cattle prepared and submitted for slaughter must comply with the requirements of the current animal health legislation. Depending on age and sex, cattle may be divided into the following 4 groups:

- Group 1 – oxen and cows;
- Group 2 - bulls;
- Group 3 - growing stock; these are animals older than 3 moths, but not older than 3 years - heifers-calves, bull-calves and steers, not used for farm work, having up to 2 pairs of constant front teeth, before the 3rd pair of constant front teeth comes through;
- Group IV - calves aged 14 days to 3 months, regardless of their sex.

According to the finish degree, cows and growing stock are divided into three categories: higher, average and below average, and calves and bulls are divided into two categories. Calves are divided into the following two categories:

- Category 1 - milk calves (fed with milk) with a live weight of at least 30 kg - mucous membranes of the eyelids are white without a reddish shade; those of gums are white or with a slight pinkish shade, those of lips and palate are also white or yellowish in color; muscles are satisfactorily developed; spinous processes of the dorsal and lumbar vertebrae are slightly probed, the hair is smooth;

- Category 2 - calves (received creep feeding) - the muscles are less developed, spinous processes of the dorsal and lumbar vertebrae protrude somewhat, the mucous membranes of the eyelids, gums, lips and palate can be of a reddish shade.
Animals that do not meet the requirements below the average finish or belonging to the second category are considered skinny.

**Consumer characteristics of beef.**

The taste, color and smell of beef directly depend on the breed, age and sex of the animal, as well as on the nature of feed and the livestock management conditions. Fresh beef should have a soft-fiber structure, rich red color and a pleasant, fresh, meaty smell. Fresh beef meat has elastic consistency, shines on the cut; forms a dimple if pressed with a finger, after which regains its shape in a few seconds. Beef fat has a soft texture and a creamy color.

According to USDA Nutrient Database, 100 g of beef contains:
- water – 67.13 g;
- proteins - 19.42 g;
- fat - 12.73 g;
- carbohydrates - 0 g.

Vitamins in beef:
- Vitamin B1 (Thiamine) - 0.049 mg;
- Vitamin B2 (Riboflavin) - 0.154 mg;
- Niacin (Vitamin B3 or PP) - 4.818 mg;
- Vitamin B5 (Pantothenic Acid) - 0.576 mg;
- Vitamin B6 (Pyridoxine) - 0.355 mg;
- Folic Acid (Vitamin B9) - 6 μg;
- Vitamin B12 (Cyanocobalamin) - 1.97 μg;
- Choline (Vitamin B4) - 67.4 mg;
- Vitamin K (Phylloquinone) - 1.1 μg.

Macronutrients in beef:
- Potassium - 289 mg;
- Calcium - 12 mg;
- Magnesium - 19 mg;
- Sodium - 68 mg;
- Phosphorus - 175 mg.

Micronutrients in beef:
- Iron - 1.99 mg;
- Manganese - 10 μg;
- Copper - 63 μg;
- Zinc - 4.55 mg;
- Selenium - 14.2 μg.

Energy value of beef: 100 g of beef contains about 192 kcal, on the average.

Beef contains high-grade, well-digested proteins, which are of great importance to the human diet. The largest amount of protein is contained in the beef tenderloin (the softest part of the carcass). Also, beef contains many micronutrients that strengthen the osteomuscular system, and the vitamins contained there have a positive effect on all systems of the human body, namely: vitamins of A group are useful for the eyesight, PP is a part of enzymes, C strengthens the walls of the blood vessels, B6 and B12 take an active part in the assimilation of iron by the body. Boiled beef facilitates recovery after injuries, infectious diseases, burns. Beef contains a small amount of fat and is considered lean meat.
4. Market analysis

4.1. Milk market

4.1.1. Main conclusions

The project is expected to produce up to 20.5 million liters of milk per year. This amounts to 2.7% of the total milk consumption in the Voronezh region and 0.4% of milk consumption in the Central Federal District. Preliminary agreements with major milk processing companies cover almost the entire amount of milk production by the project (agreements are given in the annex). The sales price of milk stipulated in the project is 24 rubles per kg.

The milk market in Russia and the Voronezh region is characterized by the following parameters:

- All major agricultural organizations of the Voronezh region engaged in dairy cattle breeding have been aimed for the past few years at increasing output and improving the quality of products. In 2014, 9.4 billion rubles was allocated to develop the industry in the region.
- In the medium term, the production of this sector will continue growing: large investment projects for the construction and modernization of dairy complexes are being implemented in the region. According to the estimates of the Government of the Voronezh region, the milk production in the region is expected to grow by 1.3 times by 2018.
- The deficit of the Voronezh region as per milk consumption is 163 thousand tons per year. Milk processing enterprises of the Voronezh region have significantly increased the output of dairy products in the recent years, hence the demand for raw materials (raw milk) has grown in the period under consideration by more than 50%, amounting to 604.5 thousand tons in 2014.
- Milk production in the Voronezh region amounts to about 3% of milk production in Russia and about 23% of milk production in the Central Federal District. The Voronezh region ranks first in milk production in the Central Federal District;
- Per capita milk consumption in Russia is about 250 kg per year and is growing. Per capita milk consumption in the Voronezh region was 320 kg in 2015 (+2 kg compared to 2014). Milk production in agricultural organizations in the Voronezh region accounts for 174 kg per capita, which provides only 54% of per capita milk consumption in the Voronezh region;
- Increase in milk consumption in the Voronezh region will amount to 123.8% by 2025, thus growing by 150 thousand tons. Therefore, per capita milk consumption in the Voronezh region will reach 335 kg per year by 2024.
- The gap in milk demand and consumption is covered by imported products, which make up 9.443 thousand tons in total in the Russian Federation, or 30% of consumption.
- The project will increase the level of milk production in agricultural organizations of the Voronezh region by 5%, which will increase regional self-sufficiency by 3% and reduce dependence on external supplies;
- Consumption of milk both in the entire Russia and in the Voronezh region shows a steady demand throughout the period under consideration. The growth of consumption in the Russian Federation was 1.5% for 2008-2014. The increase in milk consumption in the Voronezh region over the same period was 13.7%.

The following conclusions may be drawn based on the above figures:
- milk consumption in the Russian Federation is low (36% below the medical standard);
- the domestic market is significantly dependent on external supplies (30%);
- the market demand for reliable suppliers of quality products has become more acute in the recent years;
- the project will reduce the dependence of the market of the Voronezh region on imported products by 5%;
- the significance of the project is growing due to the embargo on the supply of dairy products from EU countries.
Market risks of the project are hedged by signing preliminary agreements with large milk consumers of the Voronezh region:
Talovsky Dairy Plant LLC, Lipetsk region (a preliminary agreement)
Tandem-4 LLC, Voronezh region (a preliminary agreement)
Volovsky Dairy Plant LLC, Lipetsk region (a preliminary agreement)
The milk processing project will strengthen the potential of the milk processing industry as one of the socially important sectors of the economy, increase the competitiveness of the Voronezh dairy products, provide jobs, promote the professional development of personnel through the use of modern technologies for raw milk production

4.1.2. Russian milk market analysis

General description of the milk market.
The milk market in Russia is characterized by both significant volumes of production, sales and consumption, and its social significance. Russia is among the top five world producers of milk and dairy products. The Russian dairy market has a good growth potential, as the average per capita consumption of milk and dairy products in the Russian Federation is lower than that in Western Europe and below the balanced milk consumption rate as recommended by the Institute of Nutrition of the Russian Academy of Medical Sciences. At the same time, there is a monopolization of the market observed along with the intensive expansion of the production base by foreign companies. One of the main trends of the market today is the ongoing concentration of ownership and expansion of major players’ influence. However, according to experts, given the fact that Russia has a significant territory, and the population is highly dispersed, small factories will have their own market due to the impossibility of transporting perishable milk for considerable distances. The second trend in the market is the ongoing technical modernization of production and new technologies and products emerging.

The main challenges of the milk production in the Russian Federation include:
1. Technology underdevelopment of most farms:
   - low productivity of cows in Russia - an average of 4,519 liters per cow per year (western analogues producing 7,500-8,000 liters per cow per year);
   - low quality of milk (only 5% of milk produced in Russia belongs to the highest grade);
   - manufacturers lacking milk cooling units;
   - lack of necessary forage base.
   - 50% of milk in Russia is produced in households, and not on farms, which reduces its quality and creates problems with collection and quality control.
2. Russia’s accession to the WTO limits possibilities for the state support and preserves the gap in prices. With raw milk costing less for European producers: according to Eurostat, raw milk costs about 12 rubles for kg in Germany or Belgium, while a liter of milk in German stores about costs 25 rubles. It is very often twice as expensive in Russia.
3. Barriers to entry
   - The introduction of the Technical Regulations on milk and dairy products in 2008 has tightened the requirements for milk producers and processors, both in terms of the product quality and technology of production, storage, transportation, sale and disposal of milk and dairy products.
   - High seasonal dependence of milk production determines the main risks of the industry. Reducing the level of seasonal dependence of production is a competitive advantage of a milk producer.
   - Higher cost of milk in old farms as compared with developed countries and Belarus.

Milk production.
In 2008-2014, the dynamics of milk production development in the Russian Federation was mostly negative: the average annual rate of decline in production for the period amounted to 0.8%. The
maximum reduction in milk production in Russia was recorded in 2013 (-3.9% compared to the previous year).

The main consumers of raw milk are dairy plants, which use it as raw materials to produce drinking milk and dairy products. Given that raw milk is a perishable product, and its supplies for significant distances are impossible, the main market for the products of the Project will be the area of the CDF location and the nearby regions: Voronezh, Lipetsk and Belgorod regions.

About one third of yielded raw milk is used for livestock breeding purposes (feeding young animals), about 40% accounts for whole milk products manufactured by milk processing enterprises, the rest is used for making dairy semi-finished products, including milk powder, ice cream and baby food.

![Milk Production dynamics in the Russian Federation in 2008-2014, mn tons](image)

At present, about 47% of milk is produced by agricultural organizations, the remaining 53% - by subsidiary households and farms. An extremely low concentration of production in this segment of the dairy industry shall be noted, and, accordingly, a large number of farms engaged in the production of raw milk, a part of which is impossible to account for.

Even in case of implementation of all announced investment projects of dairy cattle breeding, the increase in the total Russian raw milk production will be only 1.5-2%, which will not cover the demand for this type of product in the long term. The gap between production and consumption of raw milk in Russia in 2014 amounted to 4.3 million tons.

The following trends in the Russian industry of dairy production shall be noted:

- low productivity of cows in Russia - an average of 4,021 liters per cow per year (western analogues producing 7,500-8,000 liters per cow per year);

- low quality of milk (only 5% of milk produced in Russia belongs to the highest grade);

- farms engaged in breeding milk cattle lacking necessary forage base;

- manufacturers lacking milk cooling units;

- over 50% of milk in Russia is produced in private households, which reduces its quality and creates problems with collection and quality control. In addition, the growing share of personal household farms in the total volume of yielded milk will lead in the future to instability in the supply of raw materials, due to the highly probable reduction in the number of dairy herds during unfavorable periods.
The milk production shortage doubled from 2.2 million tons to 4.3 million tons in 2008-2014. It happened not so much due to a consumption growth, which increased by only 0.5 million tons during the period under consideration, but due to the decrease in domestic production. Milk consumption in 2015 - 2024 will show positive dynamics. The increase in milk consumption in the Russian Federation by the end of the forecast period will be 2.5%.

The volume of production of whole milk products in Russia amounted to 11.5 million tons (in terms of milk) at the end of 2014. Traditionally, more than half of the total Russian dairy production is in the Central and Volga federal districts - 51% in total (or 5.8 million tons in natural equivalent). At the same time, the Central Federal District became the only region that reduced production levels in the period from 2008 to 2014 (-13% to the level of 2008). The Volga Federal District, on the contrary, increased its output over the same period by more than a third (+ 33% against that of 2008).
On average, the annual growth rate of production of whole milk products in the Russian Federation was 1.8% between 2008 and 2014. Russian whole-milk products account for slightly more than a third of the total consumption of milk and dairy products in Russia.

Consumption of milk and dairy products in Russia over the past seven years has increased by 1.5%: from 34.5 million tons to 35.1 million tons. Here, same as for the structure of production, half of the consumed volume falls on the Central and Volga federal districts.

**Seasonal dependence of raw milk production.**
The production of raw milk has a distinct seasonal dependence associated with an extensive type of dairy farming traditional for Russia, when cows graze on pastures in summer and give a lot of milk, while in winter most households are undernourished and do not produce enough raw milk.

In summer, dairy farms experience overproduction, and prices fall, while in winter dairy producers experience an acute shortage of raw materials, and raw milk prices grow. Due to the seasonality of raw milk production and pricing, the profitability of milk sales during the summer months is significantly reduced as compared to winter period.

At the same time, selling prices of processing enterprises and consumer prices for milk and dairy products are not subject to such pronounced seasonality.

On average, the annual growth rate of production of whole milk products in the Russian Federation was 1.8% between 2008 and 2014. Russian whole-milk products account for slightly more than a third of the total consumption of milk and dairy products in Russia.

Consumption of milk and dairy products in Russia over the past seven years has increased by 1.5%: from 34.5 million tons to 35.1 million tons. Here, same as for the structure of production, half of the consumed volume falls on the Central and Volga federal districts.

**Major raw milk consumers.**
Major raw milk consumers are enterprises engaged in the production of dairy products.
Milk processing is a very important segment of the dairy industry. This is the key factor determining the prices for end products, as well as the ratio of purchase prices to prices at stores, which ultimately determines the level of profitability of producers.

Up to 40% of the total consumption in the structure of milk consumption is accounted for dairy processing and production.

---

![Diagram 1](http://expert-rating.ru/marketing_research/index.php?productID=836)


Structure of milk distribution in Russia in the main market segments:
- Milk used in livestock husbandry - 30%;
- Milk processing and dairy production - 40%;
- Production of semi-finished dairy products, including milk powder and butter - 25%;
- Production of ice cream and baby food - 5%.

The Voronezh region hosts one of the largest producers of dairy products - Voronezhsky Dairy Plant, OJSC. It ranks 5th in the processing of raw milk. Its main brands are “Vkusnoteevo” and “Ivan Poddubny”. The share of the Voronezhsky Dairy Plant in the Russian market in the segment of the traditional dairy market is 4.1%.

Market risks of the project are hedged by signing preliminary agreements with large milk consumers of the Voronezh region:
- Talovsky Dairy Plant LLC, Lipetsk region (a preliminary agreement)
- Tandem-4 LLC, Voronezh region (a preliminary agreement)
- Volovsky Dairy Plant LLC, Lipetsk region (a preliminary agreement)
Consumption of these companies alone is much higher than the capacity of the Project, amounting to 20.5 thousand tons of raw milk per year. This factor minimizes the risk of the lack of sales of products in the regional market of the Voronezh region.

4.1.3. Analysis of the milk market in the Voronezh region

**Production and consumption.**
The Voronezh region became a leader in terms of growth rates of consumption of milk and dairy products in 2008 - 2014: 113.7% by the beginning of the period. Of all regions under consideration, only Lipetsk and Rostov regions showed an increase in consumption compared to 2008. In other regions, the level of consumption has decreased. The greatest drop in demand is observed in the Tambov region, which is partly due to the demographic situation in the region, where the population declined by 4% in this period.
In general, the Voronezh Region maintains a positive dynamics of consumption of this type of products during the period under consideration, in terms of a decline in demand for milk and dairy products in the Russian Federation.
The volume of raw milk production by farms of the Voronezh region grew by 21.6% in 2008-2014. Such increase was possible due to the increase in the number of cattle in the region with a simultaneous increase of the average indicators of milk yield per cow. Thus, the cattle stock for the period increased by third and amounted to 451 thousand animals in 2014. Milk yield figures have increased by more than 20% and amounted to 5,331 kg per cow per year.

**Major consumers.**
Dairy products of the project are expected to be sold on the territory of the Voronezh region, as well as in other regions of the Central Federal District. The demand for raw milk in the Voronezh region exceeds supply, and raw milk is a deficit commodity. Major consumers of the project products will be regional dairy plants. Currently, all milk produced is assumed to be sold directly to milk processing plants and other wholesale industrial customers on the basis of preliminary signed agreements.
The initiator of the project signed preliminary contracts for milk supply with:
Bogdanovsky Dairy Plant;
Voronezhsky Dairy Plant;
Moltorg LLC
Talovsky Dairy Plant LLC;
Volovsky Dairy Plant LLC.
The subject matter of all agreements is cow milk, the volume of supplies to be determined on a regular basis according to the weekly schedule.
At the same time, these five companies alone are ready to purchase significantly larger volumes than the entire volume of raw milk production under the project.

**Pricing principles and historical dynamics of raw milk prices.**
Milk consumption in the entire Russia and in the Voronezh region shows stable demand throughout the period under consideration. The growth of consumption in the Russian Federation was 1.5% for 2008-2014. The increase in milk consumption in the Voronezh region over the same period was 13.7%.

![Dynamics of the average annual price for raw milk in the Voronezh region and neighboring areas, RUB/t](image)

The maximum price level for milk in the Voronezh region was recorded in 1Q 2015 - the average selling price of raw milk in the regional market was 22,729 rubles per ton.
The highest average annual price for raw milk in the regions studied in 2015 was recorded in the Lipetsk region (22,279 rubles per ton), the lowest - in the Kursk region (18,653 rubles per ton).
In 2014, there was a significant increase in the capacity of the raw milk market in value terms, which was due to both an increase in consumption of this type of products in the regions, and an increase in selling prices. The average annual sales price level for raw milk in 2014 increased by 25% as compared to the previous period.

The growth rate of milk prices in the forecast period was determined on the basis of the forecast price indices for agricultural products by the Ministry of Economic Development.

The dynamics of the milk price for wholesale buyers in the Voronezh region has been steadily growing over the last few years.
The forecast of milk consumption by industrial enterprises in the target regions of the Project in natural equivalent is based on the forecast indicators of Russian food industry development according to the Ministry of Economic Development until 2030 and takes into account the development programs of major market.

According to the forecast, by 2024 the volume of consumption of raw milk by industrial enterprises of the Voronezh region and the surrounding regions will amount to 3,270 thousand tons in natural equivalent and to 101,585 million rubles as per its value.

**Factors facilitating the development of Russian milk market**

1. State support of milk cattle management:
   - Subsidized part of the interest rate on current investment loans;
   - Reimbursement of a part of investment costs for new projects after commissioning;
   - Subsidies for 1 kg of marketable milk, depending on the level of market prices for raw milk.


2. Increase in personal income:
   - Increase in the proportion of high-quality dairy products in the consumer goods basket;
   - Closer attention to one's own health and increase in the consumption of quality dairy products.

3. Increase in productivity of advanced commercial dairy facilities and milk processing plants:
   - Stable increase in milk yield;
   - A trend to use modern technologies at CDFs (loose keeping, feeding by productivity groups, use of quality breeding cattle);
   - A trend to use advanced technologies for processing products.

The main analysis of the raw milk market, supply and demand forecasts, as well as the dynamics of the price level are considered in the marketing research of the Euroexpert NJCS.

4.2. **Meat market**

4.2.1. **General characteristics of the cattle meat market in the Russian Federation**

**Market capacity and consumption of cattle meat.**
Per capita consumption of meat and meat products in Russia has a positive growth dynamics. The average annual growth rate for the last 4 years is 2.8%.
The current capacity of the cattle meat market is estimated at 2.34 million tons. Consumption per capita is about 16.4 kg per year. Meat of cattle remains the third largest segment of the Russian meat market, accounting for 22% of its capacity in natural equivalent.

The meat market is characterized by:
- An unfavorable meat and dairy cattle ratio - a longer growing period of animals in comparison with poultry and pork and, as a consequence, a longer investment payback period, which makes the industry not attractive to investors.
- Poor forage base. A serious problem in the development of the industry is the lack of grazing land.
- The quality of imported beef from South America and Europe covering the lack of domestic production is at a high level, in contrast to domestic beef.
- The level of technical and process equipment availability of domestic livestock production remains low.
- Insufficient level of infrastructure development and logistic support of the market of livestock products.
- Decrease in the level of customs and tariff protection after Russia's accession to the WTO

Cattle meat production.
An annual decrease in the number of cattle in the Russian Federation leads to a gradual decrease in the production of cattle meat. The volume of cattle meat production for slaughter had fallen by 7.7% or 136 thousand tons in slaughter weight from 2008 to 2013. In 2014, the output of these products by Russian producers actually remained at the level of 2013. (1,633 thousand tons) - an increase of 21 thousand tons in figures was due to the Crimean enterprises included in the statistical reporting of the Russian Federation since 2014.

Since 2008, the Russian cattle breeding industry for slaughter has been characterized by a gradual increase in the share of meat breeds in the structure of beef production. However, today the cultivation of meat cattle in Russia is only budding. Meat breeds of cattle in the Russian production occupy a share of 8.5% in the beef consumption structure as of 2014. Currently, the supply of cattle meat in Russia does not meet the quantitative and qualitative demands of consumers, in fact there is a shortage of quality cattle meat in the market:
- National production is stagnating, 90% of cattle meat is a by-product of dairies, the specialized meat-beef industry is at an early stage of development and does not yet play a significant role in the supply of beef to the market.
- The meat industry infrastructure does not have a sufficient capacity to ensure high-quality slaughter and primary processing of livestock.
The main source of cattle meat production in Russia is culled cows and feeding stock from dairy herds, which account for almost 98% of this type of meat. The supply of cattle meat in Russia is characterized by seasonality of production, the peak of cattle meat production in Russia falling on the 4th quarter, especially on December. This is due to the increase in the live weight of livestock in spring and summer.

Thus, the main suppliers of cattle meat for slaughter in Russia are dairy enterprises. At the same time, the largest share in the structure of production of cattle for slaughter is accounted for by personal subsidiary farms. Agricultural organizations account for slightly more than a third of the total Russian cattle meat production for slaughter.

An analysis of the regional structure of cattle meat production for slaughter in live weight shows that the largest number of livestock for slaughter is kept in the farms of the Volga Federal District. In 2014, the district's share in Russian production structure was 30.6%. The Central Federal District accounted for 15% of this volume, or 437.4 thousand tons in natural equivalent.

In general, most regions of Russia have shown a decrease in the production of cattle meat for slaughter in 2008 - 2014. The Southern and the North-Caucasian districts became an exception in the period under consideration, with the aggregate increase in production being 13%.
4.2.2. Analysis of the cattle meat market in the Voronezh region

Cattle meat production and consumption, historical price dynamics

In 2013, there was a slight decrease in the capacity of the slaughter cattle meat market in value terms. This is due to both a reduction in production volumes and a certain decrease in prices relative to the previous period. It was due to a drought in 2012, when prices for all agricultural products were too high at the deficit background. 2014 brought new drivers of rising prices for cattle meat: a reduction in imports with an ongoing shortage of products in the domestic market.

By the end of 2015, the average annual sales price level for cattle meat in live weight in the Russian Federation increased by a quarter as compared to the previous period.

Historical price dynamics, supply and demand forecast

Prices for cattle meat in live weight for slaughter in the Voronezh region increased by 10.7% in 2014. In 2015 the increase accounted for another 27.7%. Thus, over the past two years, the increase in sales prices for cattle meat in live weight was 138.4%. A similar situation was observed in other regions. The Kursk Region showed the least increase (+16.4%) of the cattle meat price. Such a significant increase in the prices of cattle meat in regional markets occurs against a stably low national production, a reduction in imports caused by restrictions (Rosselkhoznadzor, the government embargo in 2014) and a general increase in the price of cattle meat in the world market and in Russia.
In 2015, the maximum annual average level of prices for cattle meat in live weight was recorded in the Saratov region (100,970 rubles per ton). The Voronezh, the Rostov and the Tambov regions are also among the regions with a price for cattle meat close to the maximum value.

Supply and demand forecast

According to the forecast, the volume of consumption of slaughter cattle meat by 2024 by industrial enterprises of the Voronezh region and nearby regions will be 159.7 thousand tons in physical terms and 20,791 million rubles in value terms.
The main analysis of the cattle meat market, supply and demand forecasts, as well as the dynamics of the price level are considered in the marketing research of the Euroexpert NJCS.
5. Organizational Plan of the Project

5.1. General implementation strategy description

The most effective means of reducing costs per unit of output is to concentrate, centralize and specialize the agricultural production. This is due to the fact that a large specialized enterprise creates conditions to use more advanced technologies, automated and robotized equipment, division of labor.

There is a rather high concentration of livestock in Russia (average farm size is more than 200 cows). Large facilities of the Shchapovo type were built for 2000 cows in the Moscow Region, for 4000 cows in the Tambov Region. Currently, dairy farms for 600, 1000, 1800, 2,400 or more cows are being built and commissioned in Russia.

There was a similar tendency throughout the world. It was most pronounced in the USA, where more than a half of the cows are concentrated on large farms for about 1000 cows. There are also giant complexes, for example, the Digan Brothers ranch in Arizona for 12.5 thousand cows with a yield of 12 tons of milk per cow per year. According to American experts, it is now economically unprofitable to build farms for less than 1,200 animals.

The following objects of agricultural production are planned as a part of the commercial dairy facility with the construction period of 18 months:

- forage agribusiness at an area of about 7,000 ha (mostly agricultural land), of which 3,668 already owned by the project and 3,000 ha of agricultural land planned to be leased;
- a farm for 2400 milk cows, 2300 animals of growing stock, 290 feeder male calves, with a daily milk production capacity of 50 tons;
  - 1 maternity and dry-keeping building (222 m x 33.8 m);
  - 3 cattle houses for the main cattle (198 m x 33.8 m);
  - 1 milking parlor (72 m x 30 m) with a rotary milking installation;
  - 1 small milking parlor 2x8 (30 m x 14 m) with herringbone milking stalls;
  - 2 sheds for calf boxes (90 m x 30 m);
  - 1 calf house for 3-6 months calves (126 m x 28 m);
  - 2 calf houses for 6-15 months calves (126 m x 30 m);
  - 2 buildings for bred heifers (126 m x 33.8);
  - 9 crossway galleries (6m x18m).
- a grain elevator with a simultaneous storage capacity of 34 thousand tons of grain;
- a mixed fodder plant with a capacity of 10 t/h.
- a farm machinery depot

5.2. Key implementation phases:

Key implementation stages:

Stage 1: Pre-investment stage (completed) (before December 2016):

- Negotiations and selection of counterparts;
- Development of the business plan;
- Development of design and estimation documentation of the P-stage;
- Undergoing the expert examination, obtaining a construction permit.

Currently, the process of consolidating the property complex to be invested in the Project (agricultural lands, property facilities of the grain elevator and farm machinery depot on the balance of Khokholskaya Agricultural Company, LLC) is nearly over, the Project Initiators having concluded contracts for the transfer of property to the Project for that reason. As a result of consolidation, Khokholskaya Agricultural Company, LLC will become the sole owner of Company KhSK LLC.
(having a part of the Project's land resources on the balance) and SKh Company, LLC (having a grain elevator on the balance).

**Stage 2: Investment stage** (duration - 18 months)
- Start: design of facilities, fund raising, orders for equipment, provision of the construction site.
- Finish: commissioning of all facilities.

**Stage 3: Operation stage** - commissioning of the production facilities (start in September 2018)
- commissioning of the CDF, the mixed fodder plant, the grain elevator with a subsequent CDF reaching the designed capacity.
  
The production plan is estimated on the basis of the planned process and the schedule for reaching the designed capacity. The annual output is 20.5 million tons of raw milk per year.
Construction of a commercial dairy facility for 2,400 animals of milk cattle with a grain elevator and a mixed fodder plant in the Khokholsky district of the Voronezh region

<table>
<thead>
<tr>
<th>Activities</th>
<th>2017</th>
<th>2018</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>January</td>
<td>February</td>
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<tr>
<td>R&amp;D</td>
<td></td>
<td></td>
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<tr>
<td>Designer supervision, engineering control</td>
<td></td>
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<tr>
<td>Internet, communication and video monitoring</td>
<td></td>
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<tr>
<td>Construction of roads to the FMD and CDF</td>
<td></td>
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<tr>
<td>Construction of temporary roads at the site</td>
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<tr>
<td>Finishing of roads to the FMD and CDF</td>
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<tr>
<td>Construction of utility networks</td>
<td></td>
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<tr>
<td>Gas supply to the CDF</td>
<td></td>
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<tr>
<td>Power supply</td>
<td></td>
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<tr>
<td>Construction of a FMD, elevator, CDF and FP</td>
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<tr>
<td>Construction of a CDF</td>
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<tr>
<td>Construction of a FMD</td>
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<tr>
<td>Construction of a grain elevator</td>
<td></td>
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<tr>
<td>Construction of a mixed fodder plant</td>
<td></td>
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<tr>
<td>Furnishing the CDF, FMD, mixed fodder plant, grain elevator, fuel and lubricant storage and canteen with equipment</td>
<td></td>
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<tr>
<td>Equipment of the CDF</td>
<td></td>
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<tr>
<td>CDF machinery</td>
<td></td>
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<tr>
<td>Equipment of the FMD</td>
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<tr>
<td>Tools and auxiliary equipment for the FMD</td>
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<tr>
<td>Equipment of the mixed fodder plant</td>
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<tr>
<td>Equipment of the grain elevator</td>
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<tr>
<td>Equipment of the fuel and lubricant storage</td>
<td></td>
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<tr>
<td>Equipment of the canteen</td>
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</tbody>
</table>
6. Sales plan and marketing strategy

Currently, there are three preliminary agreements signed. The subject matter of all agreements is cow milk, the volume of supplies to be determined on a regular basis according to the weekly schedule. The major consumers of the Company's products will be dairy and meat processing plants, primarily in the Voronezh, as well as in the Lipetsk and Belgorod regions.

Wholesale supplies of milk are planned in advance for the following customers:
- Talovsky Dairy Plant LLC, Lipetsk region (a preliminary agreement)
- Tandem-4 LLC, Voronezh region (a preliminary agreement)
- Volovsky Dairy Plant LLC, Lipetsk region (a preliminary agreement)

A retail sale at the next stage is possible within the nearest districts of the Voronezh and Lipetsk regions (within a 200 km radius) via a chain of mini-shops and convenience stores of the Project Initiator under its own brand recognized by consumers.

**Product advantages for the consumer.** The use of optimal agrotechnological solutions, advanced animal keeping standards, maintaining a high genetic potential of the cattle, application of optimal feeding patterns, and a strict veterinary and hygienic regime will enable us to product food and raw materials of the highest quality. The climate and livestock welfare guarantee the products are organic.

**Safety and sustainability.** One of the priority tasks of the Company is to ensure biological safety. Compliance with the biological safety regulations at the farm under construction is laid in the design of livestock facilities, in their location relative to each other and the main transport routes, as well as other potential sources of pathogens. Strict regulations concerning biological safety will be observed at the livestock farm: thorough fencing of facilities, vehicle entrance and exit only through a disinfectant barrier, preventive and precautionary measures taken to exclude infectious substances entering the territory of farms, special disinfectant treatment for equipment and people performing their everyday duties. These measures will prevent pathogenic bacteria entering the livestock facilities and negatively affecting the health of animals and their performance.

The cattle production will be environmentally friendly. The CDF will be equipped with modern manure removal systems and modern technologies of disposal of fallen animals.

Currently, all milk produced is assumed to be sold directly to milk processing plants and other wholesale industrial customers on the basis of preliminary signed agreements.

The main features of the agreements are given in the Table below.

<table>
<thead>
<tr>
<th>No.</th>
<th>Purchaser</th>
<th>Location</th>
<th>Date of agreement</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Talovsky Plant LLC</td>
<td>Lipetsk region</td>
<td>June 01, 2016</td>
<td>Depending on the fat and protein content, average market price</td>
</tr>
<tr>
<td>2</td>
<td>Tandem-4 LLC</td>
<td>Voronezh</td>
<td>April 26, 2016</td>
<td>Depending on the fat and protein content</td>
</tr>
<tr>
<td>3</td>
<td>Volovsky LLC</td>
<td>Lipetsk region</td>
<td>June 01, 2016</td>
<td>Depending on the fat and protein content</td>
</tr>
</tbody>
</table>

Reference: Preliminary sales agreements for the products
Thus, the volume of sales is assumed to be established on a regular basis; it may be revised subsequently. The existing demand of these consumers alone already exceeds the planned volumes of the CDF production manifold.

6.1. **Expected revenue**

Products that are not intended for domestic consumption are to be sold to third parties in accordance with the Project. At the stage of launching the production facilities, before the second stage is implemented, when the load of own grain elevator and the capacity for production of mixed fodder is still uneven and insufficient, these services will be outsourced. Due to a shortage of these capacities, these services will have a guaranteed demand in the market. In this case, they will facilitate launching of the CDF at full capacity.

**Main product groups:**

**Products of the commercial dairy facility**
- raw milk - the main product;
- cattle in live weight (culled cows and fattened growing stock) - additional products;
- breeding stock heifers - an additional product during the subsequent process of extending the herd reproduction;

All raw milk produced will be shipped to wholesale buyers after cooling in flow-through coolers and cooling tanks.

Cattle in live weight for slaughter, namely, cows and fattened growing stock will be sold to meat processing plants of the Voronezh region.

**Crop production:**
- grain;
- silo;
- hay;
- haylage.

It is planned that crop production will be used mainly for the production of mixed fodder for own herd. The excess may be offered for third-party sales; the business plan does not take these additional revenues into account and does not regard them as an additional factor of the financial sustainability of the Project.

**Milk** is planned to be produced through the purchase of highly productive cattle of the Holstein black and white breed with the declared productivity of 10,800 kg of milk per 1 milking cow per year. This will ensure high quality products, complying both with fat and protein content and other requirements of the leading milk processors.

**The breeding livestock** (heifers) is planned for sale, starting from early 2019 in a gradually increasing volume of up to 600 animals per year. Age of animals to be sold is 20-21 months (6-7 months of pregnancy) with a live weight of 500-520 kg.

**Mixed fodder** for own cattle will be produced in the amount of up to 25 thousand tons per year, which is sufficient for the cattle-breeding complex of 2,400 cows with full turnover of the herd (replacement and extra-replacement growing stock). A reserve capacity for the production of mixed fodder is created for the purpose of selling it to agricultural producers and the population, and in the future - for the production of fodder for the second phase of the project.

The business plan does not take into account additional revenues from the sale of mixed fodder to third parties, which is also an additional reserve of financial stability of the project.
6.2. Marketing strategy

Selection of the sales region. Dairy products of the Company are expected to be sold on the territory of the Voronezh region, as well as in other regions of the Central Federal District.

**Pricing strategy.** Due to the systematic excess of demand for dairy products over the offer, no significant marketing efforts are required or envisaged. The prices for the Company's products will generally correspond to the average selling price of milk producers and dairy products in the region. If products have higher consumer characteristics than substitute products, the manufacturer has the right to expect an additional bonus for quality to the price of the existing analogues.

Pricing in the region is regulated by a relationship between the agricultural producer and supplier and processing enterprises.

The quality of dairy products is regulated by Federal Law of No. 88-FZ "Technical Regulations for Milk and Dairy Products" dated June 12, 2008 and is controlled by the Veterinary Department of the Voronezh Region.

7. Production (operation) plan

The production process at the enterprise includes:
- Production of fodder for animals on the farms of the Company;
- Production of commercial dairy facility products (raw milk, cows and growing stock (culled) for slaughter, fattened bulls, breeding stock heifers).

| PRODUCT | I. Milk |  | II. Meat |  |
|---------|---------|----------------|---------|
| Volume  | liters  | 20,109,600      | Volume  | 64,798 |
| Milk    | kg      | 20,109,600      | Milk    | 64,798 |
| Marketable cattle (bulls) | kg | 59,400 |
| Breeding livestock (heifers of 18 months and older) | kg | 74,250 |
| Culled cows | kg | 222,750 |

The process cycle at the CDF includes the following stages:
- growing of replacement young animals;
- preparation of heifers for calving;
- calving of first-calf heifers;
- increasing the milk yield;
- check of first-calf heifers;
- preparation of cows for calving;
- calving of cows;
- increasing the milk yield;
- milk production.

Thus animals consistently pass the following phases of the biological cycle: calves, heifer calves, heifers, first-calf heifers, main milk flock, culling.

7.1. Crop production

Khokholskaya Agricultural Company, LLC has its own and leased land (currently about 5,000 ha for the creation of the fodder base for the Project. Growth is expected. In addition, it is planned to increase leased areas and increase arable land areas to 7 thousand ha.

The following forage crops are planned to be grown:
- cereals (wheat, oats, barley, corn);
- green mass (annual and perennial grasses, silage corn).

The land used by the CDF is located within the Zemlyansk-Repyevsky soil area, which occupies the right bank of the Don and Voronezh rivers and covers Semiluksky, Khokholsky and Ostrogozhsky administrative districts.

In respect to the soil, the region is characterized by the presence of leached and typical black soils, represented in a complex. However, typical black soils prevail in the Khokholsky district.

The humus content in typical black soils at a depth of 0-20 cm ranges from 6 to 8%, which allows to classify this black soil as medium humus soil.

The soils of the facility are characterized not only by a large content of organic substances, including nitrogen, but also by presence of mineral substances, which indicates a favorable natural environment for their formation and for a high potential fertility. The results of the nutrients gross analysis show that the typical black soils of Khokholsky district of the Voronezh region truly have a high content of mineral elements, which are a source of nutrients for plants.

Mobilization of potential nutrient reserves will be achieved through rational soil cultivation aimed at maximum accumulation of moisture and efficient use of moisture during the growing season. Thus, optimal thermal and water-air properties are created in the soil, which provide favorable conditions for microflora, which in its turn causes mobilization of nutrient substances necessary for higher agricultural plants.

It is possible to grow virtually any crops of the climatic zone on the soil of the facility, with undertaking reclamation measures (lime application) only on the fields allocated for sugar beet.

Soils with a powerful humus horizon, a large content of nutrients and good water-physical properties are most suitable for the cultivation of winter wheat. These requirements are largely met by the black soils of the facility. They have a high content of humus in the arable layer, a powerful humus horizon, high content of nutrients, favorable water-physical properties.

With a good supply of moisture, timely and high-quality agricultural practices, it is possible to produce 3,000-4,000 kg/ha of winter wheat on the black soils of the facility without any fertilizers. Despite the high fertility, the application of fertilizers on these soils is very effective; the yields of winter wheat will be 5,000-6,000 kg/ha or more with a scientifically grounded system of fertilizer application.

Barley is one of the most important forage and technical crops. The major amount of barley grain goes to forage purposes. Barley is a valuable food crop. It is characterized by a very rapid flow of nutrients, especially in the initial period of growth and development. Three weeks after sprouting, the plants contain almost half of the absorbed phosphorus and 2/3 of potassium, although less than 1/5 of the organic mass
is accumulated by this time. The high requirements of barley for soils are also due to its biological characteristics associated with a relatively underdeveloped root system and its low absorbing capacity.

Oat grain is perfect fodder. Oats are also widely used as green fodder, hay and silage, especially if combined with annual legume crops - spring vetch, peas and others. In relation to the nutritional regime, oats are less demanding than barley.

Corn is one of the high-yielding crops of versatile use. Its grain has good fodder properties and is suitable for feeding all animals and poultry. It has the most important ecological feature - it efficiently uses soil and climatic factors; proper selection of hybrids and a high level of agricultural technology ensure high yield. Corn grows on different types of soils, but maximum yields are produced on deep light clay loamy and sandy loamy soils with good water-retaining capacity and water permeability.

Sunflower is the main oilseed crop in Russia. It occupies about 70% of the acreage for this group of crops. The sunflower consumes nitrogen, phosphorus and potassium throughout the entire growing season. The total number of these elements in the plant grows with the growing mass of vegetative and generative parts.

**Description of production technology**
Crop production is the basic unit of the Project, since the initial production for commercial dairy farms is created here.
The production technology includes the following elements:
- crop rotation;
- soil management;
- provision of quality seeds;
- a park of modern agricultural machinery.

**Crop rotation**
The concept of crop rotation will be based on 4 basic, scientifically sound principles:
- biological (reduction of soil contamination with weeds, diseases and pests);
- agrophysical (optimal structure of arable layer of the soil);
- agrochemical (provision of soil with the necessary nutrients);
- economic (arrangement of cultivated crops, taking into account remoteness from consumers of crop products, in particular, energy-intensive forage crops are placed near livestock farms).

**Soil management**
An agri-business facility is given the task to optimize soil fertility and increase the productivity of the enterprise. In view of the prospects available associated with the development of livestock and the use of animal manure as a fertilizer, the Company will be able not only to have a positive balance of nutrients in the soil, but also to obtain stable harvests of high quality using up-to-date agricultural practices.

** Provision of quality seeds**
Seeds as a biological object are carriers of economically valuable traits and properties of plants, therefore the size and quality of the crop depends on their condition. The development of seeds on modern machines will promote the increase of their field germination.

7.2. Commercial dairy farm (CDF)
A commercial dairy farm for 2,400 dairy cows is planned for construction in the framework of the project; the construction site is located in the village of Kostyonki, Khokholsky district, Voronezh region. It is assumed that the cattle-breeding farm will host a breeding stock of the Holstein breed.

The breeding stock is purchased at the initial stage when the initial herd of the commercial dairy farm is formed. In the future, animals will not be sold to third parties, the herd will be replenished by culling some of the cows and replacing them with heifers grown at the Company's enterprises.

Products of commercial dairy farms:
- raw milk;
- heifers, bulls, culled cows (for meat).

The lactation period of cows is approximately 300-305 days. Milk produced at farms is collected in cooling tanks and then sent to a dairy plant.

Heifers that are not used to replenish the herd are planned for growing till the age of 18-27 months with their subsequent sale to third-party farms as a breeding stock. Bulls are fattened for slaughter until they reach 18 months. The culled livestock is slaughtered in sanitary slaughterhouses of the commercial dairy facility.

**Description of dairy facility processes**

The process concept of the project for the organization of industrial milk production on the basis of an industrial farm with a capacity of 2,400 milking cows shows the main aspects of the following processes:
- livestock welfare;
- cattle maintenance;
- removal, processing and disposal of manure;
- veterinary services;
- microclimate;
- water supply and sewerage system;
- power supply and lighting system;
- hot water supply and heating system;
- milking of cows and primary processing of milk;
- herd management and reproduction;
- growing of young animals;
- feeding and watering of livestock, storage of fodder.

**Choice of technology**

The modern technology of milk production on an industrial basis allows creating comfortable conditions for cows and good conditions for high performance of maintenance personnel. With such maintenance, high cow productivity is achieved, high quality products are obtained, at low production costs and good production profitability. Industrial milk production is impossible without production unification and standardization, which impose certain requirements for the layout and designation of the main production facilities of industrial complexes.

The most effective way of standardizing all process tasks, concentrating and specializing the activities of structural subdivisions in dairy cattle breeding is the flow-shop system of herd management, based on the inextricable physiological connection of cow’s lactation and reproduction functions.
Since the flow-shop system is a kind of conveyor belt with the consequent shop-to-shop transfer of animals throughout the whole process cycle (on the basis of their physiological state and level of productivity), animals requiring identical or similar conditions are concentrated in each workshop. This is precisely what helps to raise the efficiency of production and personnel performance.

5 shops are planned to be organized at the facility for producing milk on an industrial basis, according to the requirements of the flow-shop system:
- shop of dry cows and heifers;
- calving department;
- shop for increasing milk intensity and insemination;
- milk production shop;
- shop for breeding young replacement animals.

For the full functioning of the farm, it will also be necessary to organize:
- station of artificial insemination of cows and heifers;
- quarantine for newly arrived animals;
- hospital;
- veterinary and preventive care station;
- entrance safety barrier, internal safety barriers;
- slaughtering station;
- veterinary and sanitary pit.

Since one of the most important factors affecting the production of milk on an industrial basis is the high concentration of animals, effective organization of shops and divisions will take into account the following:
- veterinary and sanitary rules prescribed by the farm operation as per "closed cycle" principle;
- observance of "all-in all-out" and "black-white zone" principles.

**Key technical characteristics of the commercial dairy farm**

The enterprise shall be specialized in commercial production of milk, meat and breeding livestock for sale.

Designed production capacity:
- milk productivity per 1 cow - 9,500 liters, on the average;
- designed production - 20,500 tons of milk, the base fat content is 4%.

Key technical characteristics of the project after reaching the full production capacity are given in the following table:

<table>
<thead>
<tr>
<th>No.</th>
<th>Characteristics</th>
<th>Meas. unit</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Number of cows</td>
<td>animals</td>
<td>2,880</td>
</tr>
<tr>
<td>2</td>
<td>including milk ones</td>
<td>animals</td>
<td>2,400</td>
</tr>
<tr>
<td></td>
<td>Rated yield per milk cow a year</td>
<td>kg</td>
<td>9,500</td>
</tr>
<tr>
<td>3</td>
<td>Annual milk production</td>
<td>thousand ton</td>
<td>20.5</td>
</tr>
<tr>
<td></td>
<td>including per day</td>
<td>tons</td>
<td>50</td>
</tr>
<tr>
<td>4</td>
<td>Growing stock at the farm</td>
<td>animals</td>
<td>3,309</td>
</tr>
<tr>
<td></td>
<td>including 0-24 month heifers for replacement</td>
<td>animals</td>
<td>3,049</td>
</tr>
<tr>
<td></td>
<td>0-2 month bull-calves</td>
<td>animals</td>
<td>260</td>
</tr>
</tbody>
</table>

Table 11.
The calculation of livestock numbers based on the movement of the herd in 2,400 milking cows by groups and periods is given the following table.

It should be noted that the project of 2,400 milk cows requires to keep 2,640 forage-fed cows, and taking into account the culling during the first years of the project and the lack of self-replacement, it is necessary to purchase not 2,640, but 2,940 heifers, which will prevent a decrease in the number of dairy cattle.

Table 12. Calculation of the livestock numbers

<table>
<thead>
<tr>
<th>Process cattle</th>
<th>Animals in the group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cows:</td>
<td></td>
</tr>
<tr>
<td>- milk:</td>
<td>2,880</td>
</tr>
<tr>
<td>- milk:</td>
<td>2,400</td>
</tr>
<tr>
<td>- newly-calved, 1 day after calving</td>
<td>9</td>
</tr>
<tr>
<td>- newly-calved, lactation for 2-21 days</td>
<td>134</td>
</tr>
<tr>
<td>- increasing the milk yield and insemination, lactation for 22-100 days</td>
<td>644</td>
</tr>
<tr>
<td>- milk production, lactation for 101-200 days</td>
<td>787</td>
</tr>
<tr>
<td>- milk production, lactation for 201-300 days</td>
<td>787</td>
</tr>
<tr>
<td>- drying off, lactation for 301-305 days</td>
<td>39</td>
</tr>
<tr>
<td>- dry:</td>
<td>480</td>
</tr>
<tr>
<td>- early dry state, 1-40 days from drying off</td>
<td>317</td>
</tr>
<tr>
<td>- late dry state, 41-60 days from drying off</td>
<td>163</td>
</tr>
<tr>
<td>2. Growing stock:</td>
<td>3,309</td>
</tr>
<tr>
<td>- bull calves aged 0-60 days</td>
<td>260</td>
</tr>
<tr>
<td>- heifer calves aged 0-60 days</td>
<td>260</td>
</tr>
<tr>
<td>- heifer calves aged 2-6 months</td>
<td>505</td>
</tr>
<tr>
<td>- heifer calves aged 6-12 months</td>
<td>750</td>
</tr>
<tr>
<td>- heifer calves aged 12-18 months</td>
<td>742</td>
</tr>
<tr>
<td>- replacement heifers aged 18-24 months</td>
<td>742</td>
</tr>
<tr>
<td>- heifers 21 days before calving</td>
<td>50</td>
</tr>
<tr>
<td>TOTAL:</td>
<td>6189</td>
</tr>
</tbody>
</table>
The calculation of culled animals, bull calves for fattening, extra-replacement heifers is made according to NTP 1-99.

The annual culling of cows is 20-40%. Calvings are carried out evenly throughout the year. The output of calves from 100 cows is 90 animals, from 100 heifers - 100 animals. Heifers are grown to replace own herd of cows.

**Animal management technology**

**Livestock management system**

There are following management systems:

- pasture;
- stall-pasture with or without fly camp;
- stall-walking (with active exercises, using ordinary walking areas or feeding yards);
- year-round stall (zero-pasture).

An all-year-round stabling system for keeping livestock was selected for the purposes of the project. With the introduction of intensive technologies, many farms switch to year-round stall maintenance of cows with silage-concentrate type of feeding. In this case, it is easier to use milking parlors. Even a good pasture cannot provide high-yielding cows with energy, and additional feeding has to be introduced with pasture and stall-pasture keeping. In addition, switches from stalls to pasture and from pasture to stall change the whole organization of production and the management system of the herd, together with large expenditures of labor and resources and a decrease in the productivity of cows. Advantages of year-round stabling and similar feeding also includes an increase in collection of preserved fodder from 1 ha by 20-25% and an exclusion of digestive disorders in cows due to a change in the composition of bacteria in the farding bag.²

**Livestock Housing Method**

The livestock housing method is one of the important elements of livestock management technology. There are three housing methods:

- tie-up housing;
- loose housing;
- combined tie-up and loose housing.

The proposed technology provides the following housing systems in lightweight structure buildings:

1) loose cubicle housing of cows with calving in stalls
2) loose cubicle housing of heifer calves older than 6 months and heifers
3) loose deep-litter housing of growing stock aged 2 to 6 months

---

4) individual housing in cubicles or cages of growing stock aged from 0 to 2 months

Cows are kept in buildings of 2 types - for 1,136 and 752 animals. The buildings are divided into sections in accordance with the production characteristics, milking parlor capacity and the current planning standards for the process groups kept there. All sections have a separate exit to the common cattle-run gallery and therefore animals from different sections cannot come in contact with each other. Inside its section, a cow has free access to the feed table, drinking bowls and rest areas.

For each cow, an individual 1.20 m wide and 2.50 m long cubicle is provided along the separation axes. The animals are located in cubicles facing each other. The special design of the box enclosure (collector) and the parameters of the individual cubicles (the length of two boxes is 5 meters) optimally correspond to the cow’s biomechanics of movement and physiology, which provides the conditions for high comfort and long rest of animals.

Taking into account the process need, it is feasible to use two types of premises for keeping dairy cattle.

The first type of premises for keeping milk cows is a six-row building, 35 m wide and 198 m long, which has proved to be the most efficient in operation due to a combination of economic and technological factors.

However, it is preferable to use the second type of the building, with a four-row layout, 30 m wide and 222 m long, for cows being at the first third of lactation, given their high feeding and maintenance requirements. It is possible to place animals in smaller groups in such building, including at the expense of the side galleries of the building.

Along the central axis of the six-row buildings for keeping milk cows, there is a 5 m wide fodder table, on both sides of which the following objects are symmetrically placed:

- a feeding manure passage for feeding from the fodder table and for movement, 4.2 m wide;
- a double row of "head-to-head" cubicles, 5 m wide, separated by passages from one row to the other; drinkers are installed in the passages;
- a manure passage for the cow movement, 3 m wide;
- a single row of "side-by-side" cubicles.

Along the central axis of the four-row buildings for keeping milk cows, there is a 5.5 m wide fodder table, on both sides of which the following objects are symmetrically placed:
- a feeding manure passage for feeding from the fodder table and for movement, 4.2 m wide;
- a single row of "side-by-side" cubicles, 2.5 m wide, separated by passages from one row to the other; drinkers are installed in the passages; a manure passage for the cow movement, 3 m wide; a single row of "side-by-side" cubicles.

In these buildings, animals may all use the feeding table at the same time and can be fixed for a short period of time in the headlocks installed for veterinary operations. Also, animals are less likely to conflict and quarrel in case of headlocks present during feeding, which has a positive effect on the fodder consumption, especially by lower animals.

A separate building for calving is located next to the building for keeping dry and new cows. The calving department accommodates 12 individual stalls, a feed room, a staff accommodation room and cages for newborn calves.

With the first signs of calving, the animal is transferred from late dry period section to a clean, strawed individual stall. If it is necessary to provide obstetric aid, the animal can be fixed in the headlock. Stalls are equipped with heated drinking bowls. After calving, the cow is allowed to lick the calf. After weighing, the new-born is placed in a clean disinfected individual cage under an infrared lamp, the umbilical cord is treated, the calf is marked and given the first portion of the proven quality colostrum preheated in a water bath. The cow is transferred to the section for new-calved animals and milked in the next milking, collecting the colostrum in the tank. The stalls are immediately cleaned and disinfected.

The milking block near the storage tank has a sanitation area, where animals enter, when passing along the return corridor through the selection gate after milking. A palpation area is established there. When animals are driven into the area, it is possible to carry out veterinary treatment, artificial insemination, pregnancy tests, when the animal is fixed. A hoof treatment unit is located in the same area.
Hoof treatment is one of the most important veterinary procedures for cattle. Cow disposal due to hoof-related diseases is the second most frequent disease after mastitis on farms with loose housing, which causes heavy losses. At the farm, hooves will be trimmed at least 2 times a year. Also, there is a control of the hooves condition between hoof trimmings using the "hoof valuation" method, when the cow's back line is evaluated while standing still and in motion as per a five-point scale. In addition to trimming, hooves will be treated with a formalin solution with copper sulfate in a bath. Formalin strengthens the hoofs, and copper sulfate improves breakage resistance. The treatment is scheduled to be held weekly.

Growing stock under 13 months will be kept in groups in sections on a removable litter of straw, after 13 months - under conditions close to those for cows, i.e. in a large groups, according to loose method in light-weight cubicles on comfortable mattresses with litter.

After being born and staying with the mother in the calving stall for an hour, the calf enters an individual cell, where its umbilical cord is treated, it is dried, given colostrum, and then, after 6-8 hours, transferred to an individual cubicle equipped with everything necessary for comprehensive growing of a milked calf - an open-air cage, a set of fodder inventory, effective ventilation and easy maintenance.

The cubicles for calves are located in a 30 m wide building. There are curtains on the side walls of these buildings, which allows to protect the calves from drafts and precipitation in case of bad weather conditions. The buildings have wide passages for the mechanized distribution of fodder to calves and cleaning the litter from the cubicles.

Even in winter, the calf gets everything it needs and the healthy animal easily resists even severe frosts if it has a deep straw litter and correct feeding.

After the end of the dairy period and up to the age of 6 months, the calves are transferred to the group mode of keeping in sections on the removable straw litter. The buildings are interconnected by a transitional central gallery, which makes the movement of animals from one building to another much easier, with a smaller number of maintenance personnel required. The first building houses calves from 2 to 6 months in small groups. In the second and third buildings there are heifers aged 6 to 15 months housed. Skew gratings are installed on feeding tables in these buildings, and passages are provided along the side walls, which allows unhindered independent passage of personnel to each group; correspondingly, a diseased animal can be removed from any group if necessary without stressing the remaining animals.

Heifers aged 15 to 24 months are housed in two 33 m wide six-row buildings. The housing in this building is close to those of cows, taking into account the corrections for the age group of the animals. There are rows of comfortable cubicles in the sections with the addition of litter on the mattresses; the
cubicles are separated by passages between the aisles where the drinkers are installed. Manure is removed with scrapers to a central manure channel.

Headlocks are installed at one quarter of the feeding table in a building where heifers aged 15-24 months are placed, for the convenience of fixing animals with hormonal treatments and artificial insemination.

**Manure removal**

According to the requirements of milk production technology on an industrial basis, the manure removal system meets the following basic requirements:

- provides a constant and easily maintained cleanliness in the cattle-breeding premises;
- restricts the formation and release of harmful gases into the animal housing area;
- excludes transfer of infectious matter with manure and sewage from one process site to another;
- is easy to operate, does not require large costs for management, repair and sanitation.

The yield of manure from the facility is shown in the table below, the liquid non-littered manure is accumulated from buildings with loose-stall housing, semi-liquid litter manure - from the buildings where animals are kept on the replaceable straw litter.

<table>
<thead>
<tr>
<th>Manure removal from the facility</th>
<th>Volume:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Manure type:</strong></td>
<td></td>
</tr>
<tr>
<td>Liquid non-littered manure, moisture up to 90%</td>
<td></td>
</tr>
<tr>
<td>Daily output</td>
<td>285 tons</td>
</tr>
<tr>
<td>Monthly output:</td>
<td>8,700 tons</td>
</tr>
<tr>
<td>Output for 9 months:</td>
<td>78,300 tons</td>
</tr>
<tr>
<td>Mass volume for 9 months:</td>
<td>86,130 m$^3$</td>
</tr>
<tr>
<td>Other process drains to the lagoon</td>
<td>21,000 m$^3$</td>
</tr>
<tr>
<td>Designed lagoon capacity</td>
<td>107,130 m$^3$</td>
</tr>
<tr>
<td>Usable area of lagoons, storage depth 5.0 m</td>
<td>21,246 m$^2$</td>
</tr>
<tr>
<td>Operating dimensions of 1 lagoon (total 4 lagoons)</td>
<td>75 x 75 m</td>
</tr>
<tr>
<td>Semi-liquid littered manure, moisture up to 85%</td>
<td></td>
</tr>
<tr>
<td>Daily output</td>
<td>50 tons</td>
</tr>
<tr>
<td>Output for 12 months:</td>
<td>18,250 tons</td>
</tr>
<tr>
<td>Output for 4 months:</td>
<td>6,100 tons</td>
</tr>
<tr>
<td>Mass volume for 4 months:</td>
<td>8,500 m$^3$</td>
</tr>
</tbody>
</table>

All manure removal systems can be divided into mechanical and hydraulic ones, both systems are used on the farm. Hydraulic systems can be flushing and self-draining. The farm will use the flushing hydraulic system. Mechanical systems include: scraper conveyors, rod conveyors, screw conveyors, scraper plants, mobile manure-handling units, and combinations of units. Scrapers will be used on the farm.

Due to the considerable length of the building and the need to ensure a high hygienic status in the premises, the manure is removed from the passages by delta scrapers to manure collectors located in the center of the yards.

Further removal of manure is organized through a pipeline system designed specifically for regions with a severe climate and frosty winters, being in essence similar to domestic sewage system. This approach completely excludes the system freezing, provides low-cost transport of liquid manure to the lagoon. The system is fully automated and easy to operate. Disposal and disinfection of manure in the lagoons occurs biologically under aerobic conditions, which is the most environmentally friendly method.
of processing it into a quality organic fertilizer. After ripening, the manure masses are unloaded and added to the soil.

**Environment**

When producing milk at an industrial scale, it is very important to create optimal environment conditions for cattle in all production premises. The loss of productivity due to the cow's body adapting to an unfavorable environment can reach 18-20% or more in total.

The farm operation will meet the requirements for the maximum allowable dust content in buildings for cattle - 5 mg/m³, for noise levels - not exceeding 70 dB, and for calves - not exceeding 65 dB.

Given the biological specifics of cattle and especially high-yielding cows, the following factors were taken into account when organizing an environment within livestock premises:

- inside and outside temperatures, and their difference;
- wind velocity, absence of drafts;
- indoor moisture;
- ventilation mode;
- comfortable rest conditions for the livestock.

According to the project, the walls are made of height-adjustable curtains of two-layer polystyrene film. A specifics of the proposed curtain material is the presence of separate interconnected tubes between the layers, which, depending on the outdoor temperature and wind velocity, allow increasing the thickness of the closed curtains and reduce their thermal conductivity by inflating, which is especially important for a long period of low temperatures. In the warm season, the curtains are completely open, and the natural climatic regulation mechanism already operates in the room, which additionally reduces their wear. In combination with efficient ventilation, such design of walls makes it easy to regulate air exchange and indoor temperature for keeping animals, thus optimizing the environment and creating the best conditions for high productivity.

A natural ventilation system is provided in cow houses, which ensures optimal fresh air intake and air exchange at the rate of at least three times per hour. This scheme shows reliable operation regardless of weather conditions.

Programmable electric fans are installed indoors additionally to increase air and heat exchange, reduce heat stress in cows, for the period of the highest temperatures (above +25 °C). They are calculated according to the number and power.

**Water supply and sewerage system**

The designed facility includes the following water supply and sewerage systems:

- process and domestic water supply;
- fire water supply;
- industrial and domestic sewerage to treatment plants or a septic tank (to be specified by the project);
- storm water drain.

The water supply to the facility is provided from its own water intake unit - artesian wells with Rozhnovsky water stations (RWS), with a capacity of 15 to 50 m, a 10-18 m high support, which will be located at a distance of the sanitary protection zone determined by calculation and as per approval of local agencies of sanitary and epidemiological supervision.

Underground water supply to drinkers and the use of special electrically heated drinkers are provided. Cows prefer drinking from a shallow drinker with an open water surface. In order to organize
watering of newly calved cows in the calving shop, heated insulated drinkers are provided, allowing the newly arrived cows to recover faster for a new lactation.

Power supply and lighting system

The power supply of the complex is provided from own transformer substation. The final installed capacity is specified by the design in accordance with an applied manure removal system, the heat supply regime at the facility, lighting of production facilities and the outdoor site, light conditions in cattle-breeding premises, and other power loads.

There are 2 light sources - natural and artificial lighting. The availability of light in the daytime is provided through a light-ventilation ridge on the roof and through open side walls or transparent curtains. In the evening and at night, as well as in bad weather, it is recommended to maintain the lighting of 100 lux above the feeding table, and standby lighting at the rest of the area.

There should be good lighting in the milking parlors, both due to natural and artificial light sources. Optimum illumination will be at least 200-250 lux.

Heating and hot water supply

This project stipulates hot water supply to the following facilities:
- administration and utility premises of the milking unit;
- milking parlor;
- veterinary and sanitary unit;
- milk feed preparation unit;
- slaughter unit;
- veterinary sanitary checkpoint.

A combined heat source, namely recuperation heat from milk cooling with subsequent water heating using a double circuit gas boiler with a capacity of 28-29 kW, will be used as a heat source in the milking unit, including for washing the milking equipment.

The following facilities will be heated in different temperature modes (from +4.0 ..+5.0 to 22°C):
- administration and utility premises of the milking unit;
- milking parlor;
- accumulator;
- veterinary and sanitary unit;
- milk feed preparation unit;
- slaughter unit;
- veterinary sanitary checkpoint;
- vehicle garage;
- automated weighing unit.

An estimated total annual heat consumption for heating, ventilation, hot water supply, process purposes, boiler auxiliary loads shall not exceed 500 Gkal with accounting for losses in the utilities of the designed facility.

Cow milking and commercial milking parlor

A passing gate from the section shall open for cows to move to the milking parlor, the cows then moving along the central gallery to the accumulator. The gallery is a wide hallway, which can be divided for simultaneous cows’ movement to the milking parlor and back to the section after being milked. This system does not require additional personnel to control the cattle movement - the cows go freely along the gallery; however when the entire group to be milked gathers in the accumulator, it is divided by a pneumatic crowd gate, with entry of new cows from another group possible after these animals go further.
The cows in the accumulator are gathered with a pneumatic crowd gate to the entrance to milking stalls via identification gates. When each cow passes through the gates, the transponder reads the cow ID and transfers it to the electronic control unit of the respective milking stall.

The cows to be milked are positioned in parallel to each other and transversely to the milking operating place. Such placement of animals optimally meets cattle milking requirements for commercial milk production.

After a cow enters the milking stalls, its teats are treated with a disinfectant, foremilk drained, teats wiped with paper tissues, thus their neurons are stimulated to produce the oxytocin hormone. The milk flow begins; the milking devices are connected at the 90th second, and the milking process begins. The amount of produced milk and the milking time for each stall are shown at the electronic control panel of the stalls.

Rotary milking installations and herringbone milking stalls are used at the farm. The advantage of the herringbone milking stall is its narrow width. They easily fit to a six-meter construction bay, which allows their placing in typical milking units of commercial dairy farms. The advantages of the stalls also include a good view of the cow’s udder and free access to it by the milk operator.

A rotary milking installation with parallel stalls is selected for the farm design. Cows will enter the installation one by one, and exit in the same manner, therefore the number of cows in a process group does not have to be divisible to the number of stalls of the installation. Rotary milking installations are competitive to other systems in terms of space occupied.

After milking is over, which is determined by the system according to the intensity of the milk flow and is a programmable function, the vacuum on the milking machine is automatically turned off and the milking machine is removed with no human assistance needed. After the machine is disconnected, the milk output per minute and a comparative amount of milk (more or less) is indicated on the electronic display in respect of the three previous days. When the milking machine is disconnected, the operator treats the teats with a solution containing iodine and emollients.

Milk from the milking machines goes through a metering unit to the milk lines and then into a milk collector, from where it is pumped through a filter to a flow cooling system (a chiller) and to a milk tank with a temperature not exceeding +4°C for further storage until dispatched to a dairy plant.

The following parameters are critical for the milking parlor:
- milking time for a single process group not exceeding 120 minutes per day;
- a capacity of at least 4.4.5 rounds per hour;
- load per one operator (including replaced ones) is 200 cows per hour;
- accurate production data from each milking stall;
- the number of somatic cells not exceeding 200,000/cm³, CFU not exceeding 50 thousand per gram, milk temperature not exceeding 4°C;
- high equipment reliability;
- easy operation.

**Cattle reproduction**

The main tasks of managing the cows reproduction for the industrial milk production are as follows:

- achievement of peak milk productivity on the 40th-60th day of lactation;
- successful insemination before the 85th day of lactation;
- confirmation of pregnancy on approximately the 100th day of lactation;
- timely transfer of a cow to the milk production department, adjustment of its diet and implementation of planned veterinary measures (prevention, hoof treatment, etc.).

An effective insemination system is critically important for the farm operation. This task will be handled by a specially equipped artificial insemination station, located near the milking parlor. Cows identified as being in heat are moved through the sorting gate to the artificial insemination station, which is done, as a rule, after the first milking. Heat is detected based on visual observation. All workers of the facility will be engaged in identifying cows in heat, if possible, first of all cow care operators, milking operators, drivers, and artificial insemination specialists.

The project stipulates the use of the world’s most effective practices and a combination of both visual detection of cows in heat by specialists and programs (including the Russian ones) aimed at stimulation and synchronization for the purposes of cattle reproduction.

The implementation of such a program requires special technical and production equipment (reproductive department), which is stipulated in the design of the facility:

- detection of dry cows, separate housing and feeding of early-dry and late-dry (pre-calving) periods, as well as heifers;
- arrangement of calving in special maternity stalls;
- separate housing and preventive care for newly-calved cows;
- possibility of daily monitoring of the condition of newly-calved cows;
- organization of rectal examination and insemination area for cows;
- furnishing the premises for housing the milk cattle with headlocks.

With good housing conditions, feeding and timely insemination provided, the duration on an inter-calving period of the cow is close to a natural one, i.e. to 365 days. A cow is moved from a shop to a shop during this period.

The project initiators pay close attention to measures to reduce the inter-calving period. Also, in addition to balanced feeding, the farm will be highly effective in detecting cows and heifers in heat and their insemination; there will be improved conditions for animals housing, especially in preparing the cows for calving and the calving itself, and also during the first three months of lactation.

**Animal feeding**

The yield of cows is 60-65% determined by their feeding; therefore, the process line is perhaps the most important. It accounts for about 40% of all labor costs at the farm, and expenses for the feed
are about 60% of the production cost. Fulfillment of the livestock genetic potential depends on the nutrition value of feeding, being 50% determined by the provision of animals with metabolic energy, 25% with proteins and 25% with mineral substances and vitamins.

The composition and nutritional value of the diet, and the feeding process of cows are different at each phase of the inter-calving period and are determined by their productivity, weight and age.

Since the cow drinks the average of 5-8 liters of water per minute, at least 10-20 liters of water shall be provided in the drinker during this time. Drinkers on the farm will be located near the feeding area so that the cow does not have to travel long distances, alternating food and drink. The size of the drinkers ensures that several animals at once may have access to them, which corresponds to the herd lifestyle of the cattle. Several drinkers will be installed in each section to allow animals of a lower rank to have access to water at any time of the day. The heat of the cooled milk will be used to heat water in the automated drinking system with heat capacity of 3.91 kJ/kg°C.

The organization of feeding of high-yielding cows at the commercial dairy facility will be based on a general mixed diet (TMR), designed not for the needs of each cow, but taking into account the needs of each process group, which is effectively carried out by means of the shop and the cattle management program.

High-efficient mixing feeders with a capacity of 20 m are planned to be used in the project, which allows complete control over the preparation and distribution of mixed fodder. Moreover, such mixer feeders are also noted for their high production reliability. The large capacity of the mixing feeder allows distributing fodder to a group of cows at a time with a high quality of mixing, which prevents sorting of the feed by cows with some fodder remaining uneaten. It also allows combining a number of process operations within the duty schedule of one employee, for example, loading and mixing fodder or distributing fodder with a mixer and maintaining a feed table.

The calculation of needs for and stock of fodder accounts for the number of animals, diets, bulk weight of fodder, the year-round stalls type of housing; the productivity of animals, their age, physiological condition, and nutritional value of fodders are also taken into account in accordance with "Approximate annual feed requirements for cattle (as per NTP 1-99) and the international practice of organizing high-grade feeding of high-yield dairy cattle and young animals."
The following shall be provided at the facility to organize high-grade feeding:
- fodder storage with a capacity of at least 2-week supply of mixed fodder;
- a fodder area to prepare a mixed diet;
- a warehouse at the fodder area to store feed ingredients (mixed fodder, premix, seed meal, treacle, etc.);
- ground silo trenches, or a platform for laying mounds, or plastic hoses;
- a hay barn or shelter for storing pressed hay
  a platform or a shelter for storing pressed litter straw, a weighing station equipped with electronic scales for 60 tons and a room for personnel with an area of 8.5-10 m;
- a hangar for agricultural machinery used.

Measures to improve the milk quality

The system of measures to improve the quality of milk is based on the unconditional maintenance of animals’ health and milking hygiene jointly with activities to prevent diseases of cows, especially mastitis.

An appropriate system of measures stipulates the following:

• early diagnosis of mastitis (monitoring during milking);
• operative treatment of mastitis with imported preparations (an approximate dose is 3 syringes per a teat);
• use of dry udder disinfection method (0.02% hypochlorite solution with subsequent drying) instead of wet wiping;
• use of disposable napkins for udder treatment;
• draining "foremilk" in a special vessel with a dark partial wall (the dark background makes it easy to detect "flakes" in the milk of animals suffering from mastitis);
• treatment of the udder after milking with lanolin solution;
• application of 60 Hz pulse frequency during milking and a pressure of 0.38 kPa in order to provide the most comfortable conditions for the animal.

Strict compliance with the standards of feeding, keeping, hygiene, prevention, early detection and treatment of diseases of the forage livestock will make it possible to obtain raw dairy materials of the highest taste characteristics, which is the basis for the successful implementation of the project under consideration.
Measures to ensure the cattle meat is organic and safe

Growing cattle shall be regulated by feeding standards for needs of baby and diet food, in particular, TU 9211-362-00419779-98, which stipulates strict requirements as to the content of toxic metals, residual amounts of pesticides; no residual amounts of antibiotics and nitrosamines are not allowed.

Young cattle aged from 2 to 16 months will be delivered for slaughter and processing in accordance with GOST R 50848-96 ("Requirements for growing, feeding young cattle for baby food meat"). Young animals shall be grown and fed in accordance with special agronomical, veterinary and hygienic requirements without the use of growth stimulants, hormonal preparations, in-feed antibiotics, synthetic nitrogen-containing substances, products of microbial synthesis and other non-standard feed.

Veterinary and sanitary examination of raw materials organized at the commercial facility will completely exclude the possibility of using meat from animals infected with spongiform encephalopathy.

Production risks

The key factors that impair the performance of loose-housing dairy farms are:

1. The managers, specialists and personnel being unqualified in this technology and technical means; insufficient knowledge of computer programs and inability to use them. Information systems of modern farms have a wide range of features which are used in most farms only by 15-20% according to the data of service departments.
2. Underestimation of the role and importance of the manager (the foreman, manager or livestock expert) at the farm, who is responsible for taking prompt decisions on the maintenance of cows based on the data from automated information systems, aimed at taking into account individual characteristics of each animal and eliminating their depersonalization.
3. Unjustified choice of technologies for the cattle keeping and maintenance, unfitness to local environmental and climatic conditions.
4. Absence of a preliminary calculation of the farm process parameters.
5. Improper distribution of process groups resulting in differences of cows in sections as per yield and physiological condition, which complicates their dietary feeding and livestock expert service.
6. Failure to comply with requirements for internal layout of the cattle houses and parameters of the stall equipment, which worsens the conditions of animals keeping.
7. Insufficient attention to the provision of effective veterinary animal health services, lack of sanitary areas or their haphazard layout.

The following activities will be performed to avoid negative consequences when modern technologies for the maintenance and servicing of cattle are applied:

1. Training of specialists, foremen and machine milking operators in all details and characteristics of loose cattle housing and cattle management with modern computer programs. Organization of internships at enterprises that have already mastered loose housing.
2. High-quality design of facilities with modern process principles of cattle housing taken into account and qualified designers and process engineers involved and with active participation of specialists of the farm.
3. Participation of specialists of the farm, the head of the farm, and foremen in the farm construction and commissioning. Special attention shall be paid to:
   - Layout of premises, size and location of sections;
   - Structure and dimensions of the stall process equipment;
   - Quality of the floors in the manure and feeding manure passages, hallway passages, cattle-run gallery, accumulator of the milking parlor, in the hall;
4. Before the first group of animals is arranged, there are measures planned for a trial run of the milking, feeding and manure-collecting equipment, checking the operation of automated drinkers and ventilation systems, the reliability of fixing the gates and fences, and locks. A double standard dose of fodder will be provided at the fodder table of the section the cows will be accommodated in.

5. Adjustment of the position of the head locks in the boxes and at the feeding table, corresponding to the size of the animals.

6. Detection of aggressive cows and cows inclined to lie in manure passages when free cubicles are available, with the removal of such animals from the group.

7. As the process groups are formed, special attention will be paid to their homogeneity.

7.3. Elevator and mixed fodder plant

The lack of linear elevators’ capacity is about 26% of the total capacity. In the grain sector, this results in crop losses, high storage prices and, accordingly, a decrease in the production profitability, and seasonal price fluctuations in the domestic market.

Based on the existing situation, an own elevator is an integral part of the overall plan for vertical integration in the production of marketable milk at the CDF. It is planned to equip the existing building with an elevator with modern automated equipment and to commission a modernized elevator with a total storage capacity of 34 thousand tons to commercial operation.

The accounting of grain movement and control over the elevator operation will be computerized. The production and technology laboratory will be equipped with the instrumentation for timely identification of all the necessary quality indicators of grain and sunflower oil seeds. The modernized elevator will have a gas-fired grain dryer for 64 tons per hour.

The elevator will provide additional income to the Project through rendering services to third parties for processing customer-owned/commercial grains: sorting as per weed content and moisture, drying, storage.

Unlike poultry farming and pig breeding, which almost exclusively use mixed fodders, the main fodders in cattle breeding are coarse and succulent fodders. Mixed fodder are used in an amount not exceeding 30% of the diet.

Own mixed fodder is produced within the framework of the vertical integration approach to the production of marketable milk. Mixed fodder will be produced in a complete C5bu container plant by Ottevanger milling engineers (Netherlands) with a capacity of 10 tons of bulk mixed fodder per hour. The plant has an installed capacity of 175 kW, is equipped with a 55 kW hammer crusher, fully automated computer process control system with PLC controllers. The plant capacity for receiving raw materials is 40 m3/h. The plant is promptly delivered – within 4-5 weeks from the date of shipment - in three standard 20 Ft containers. The supplier provides installation supervision for the assembly, which ensures a relatively short installation time with proper quality, a guarantee from the manufacturer and relatively low costs.
C5bu mixed fodder plant by Ottevanger milling engineers
7.4. Modern agricultural machinery

Today, Khokholskaya Agricultural Company, LLC has a modern fleet of agricultural machinery and equipment, which allows performing certain types and volumes of work with the highest quality production. Taking into account an increase in the volume of work and the cultivated land, additional agricultural machinery is planned to be purchased. Company relies on scientific and technical achievements and takes into account the world’s and national experience in the formation of the machine and tractor fleet.

The existing machine and tractor fleet is shown below:

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Year of manufacture</th>
<th>Brand</th>
<th>Quantity (pcs)</th>
<th>Price (rubles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tractor</td>
<td>1987</td>
<td>K-701</td>
<td>1</td>
<td>850,000.00</td>
</tr>
<tr>
<td>2</td>
<td>Tractor</td>
<td>1991</td>
<td>K-701</td>
<td>1</td>
<td>100,000.00</td>
</tr>
<tr>
<td>3</td>
<td>Tractor</td>
<td>1990</td>
<td>T-150K</td>
<td>1</td>
<td>15,000.00</td>
</tr>
<tr>
<td>4</td>
<td>Motor car</td>
<td>1993</td>
<td>UAZ</td>
<td>1</td>
<td>98,000.00</td>
</tr>
<tr>
<td>5</td>
<td>Disk harrow</td>
<td></td>
<td>BDT</td>
<td>1</td>
<td>249,000.00</td>
</tr>
<tr>
<td>6</td>
<td>Disk harrow</td>
<td></td>
<td>BDT</td>
<td>1</td>
<td>750,000.00</td>
</tr>
<tr>
<td>7</td>
<td>Cultivator</td>
<td></td>
<td>KPS</td>
<td>2</td>
<td>80,000.00</td>
</tr>
<tr>
<td>8</td>
<td>Plough</td>
<td></td>
<td>PLN</td>
<td>2</td>
<td>70,000.00</td>
</tr>
<tr>
<td>9</td>
<td>Beam crane 1t</td>
<td>1981</td>
<td></td>
<td>1</td>
<td>40,000.00</td>
</tr>
<tr>
<td>10</td>
<td>Turning lathe</td>
<td>1967</td>
<td>K-62</td>
<td>1</td>
<td>20,000.00</td>
</tr>
<tr>
<td>11</td>
<td>Drilling machine</td>
<td>1969</td>
<td>A-135</td>
<td>1</td>
<td>30,000.00</td>
</tr>
<tr>
<td>12</td>
<td>Drilling machine</td>
<td></td>
<td></td>
<td>1</td>
<td>15,000.00</td>
</tr>
<tr>
<td>13</td>
<td>Pneumatic hammer</td>
<td></td>
<td>4120</td>
<td>1</td>
<td>60,000.00</td>
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<tr>
<td>14</td>
<td>Gas welding equipment</td>
<td></td>
<td></td>
<td>1</td>
<td>3,000.00</td>
</tr>
<tr>
<td>15</td>
<td>Oxygen cylinder</td>
<td></td>
<td></td>
<td>3</td>
<td>5,000.00</td>
</tr>
<tr>
<td>16</td>
<td>Propane cylinder</td>
<td></td>
<td></td>
<td>1</td>
<td>2,000.00</td>
</tr>
<tr>
<td>17</td>
<td>Tank</td>
<td></td>
<td></td>
<td>2</td>
<td>20,000.00</td>
</tr>
<tr>
<td>18</td>
<td>Kärcher</td>
<td></td>
<td></td>
<td>1</td>
<td>17,000.00</td>
</tr>
<tr>
<td>19</td>
<td>Compressor</td>
<td></td>
<td></td>
<td>1</td>
<td>60,000.00</td>
</tr>
<tr>
<td>20</td>
<td>Fettling grinding machine</td>
<td></td>
<td></td>
<td>2</td>
<td>30,000.00</td>
</tr>
<tr>
<td></td>
<td>TOTAL:</td>
<td></td>
<td></td>
<td>26</td>
<td>2,514,000.00</td>
</tr>
</tbody>
</table>

List of necessary equipment (as per the commercial offer):
<table>
<thead>
<tr>
<th>Product name</th>
<th>Q-ty</th>
<th>DAP VAT excl. per unit</th>
<th>DAP VAT excl. Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Super-heavy tractor, 620 hp CASE</td>
<td>1</td>
<td>€ 594.750.00</td>
<td>€ 594.750.00</td>
</tr>
<tr>
<td>Heavy tractor 340 hp with doubled wheels</td>
<td>3</td>
<td>€ 289.450.00</td>
<td>€ 868.350.00</td>
</tr>
<tr>
<td>Medium tractor 180 hp CASE</td>
<td>3</td>
<td>€ 159.250.00</td>
<td>€ 477.750.00</td>
</tr>
<tr>
<td>Light tractor 120 hp</td>
<td>5</td>
<td>€ 96.750.00</td>
<td>€ 483.750.00</td>
</tr>
<tr>
<td>9-casing reversible plough with hydraulic protection, non-stop</td>
<td>2</td>
<td>€ 70.750.00</td>
<td>€ 141.500.00</td>
</tr>
<tr>
<td>2-row disk header + packer compactor, 6 m operating width</td>
<td>2</td>
<td>€ 43.000.00</td>
<td>€ 86.000.00</td>
</tr>
<tr>
<td>Cultivator, 7.5 m wide toothed compactor + 2nd leveler compactor</td>
<td>1</td>
<td>€ 50.250.00</td>
<td>€ 50.250.00</td>
</tr>
<tr>
<td>Cultivator 5.5 m wide</td>
<td>2</td>
<td>€ 30.750.00</td>
<td>€ 61.500.00</td>
</tr>
<tr>
<td>Manure spreader PMF</td>
<td>1</td>
<td>€ 38.500.00</td>
<td>€ 38.500.00</td>
</tr>
<tr>
<td>20,000 L tank with fertilizer addition, operating width of 5.3 m</td>
<td>2</td>
<td>€ 66.700.00</td>
<td>€ 133.400.00</td>
</tr>
<tr>
<td>Trailering fertilzer spreader, 8.5 m3</td>
<td>2</td>
<td>€ 50.750.00</td>
<td>€ 101.500.00</td>
</tr>
<tr>
<td>Seeding complex, operating width of 8 m</td>
<td>1</td>
<td>€ 194.250.00</td>
<td>€ 194.250.00</td>
</tr>
<tr>
<td>12-row seeding machine 75mm, 9m wide</td>
<td>7</td>
<td>€ 54.000.00</td>
<td>€ 378.000.00</td>
</tr>
<tr>
<td>Motorized sprayer for 4,000 L, 215 hp, operating width of 24 m</td>
<td>3</td>
<td>€ 259.700.00</td>
<td>€ 779.100.00</td>
</tr>
<tr>
<td>20,000 L wheeled stainless steel tank with mixing and liquid loading equipment</td>
<td>3</td>
<td>€ 69.700.00</td>
<td>€ 209.100.00</td>
</tr>
<tr>
<td>Rotary mower with rollers to press stems, operating width of 5.8 m</td>
<td>3</td>
<td>€ 28.500.00</td>
<td>€ 85.500.00</td>
</tr>
<tr>
<td>12-star rowers, operating width of 600-740 cm</td>
<td>3</td>
<td>€ 10.000.00</td>
<td>€ 30.000.00</td>
</tr>
<tr>
<td>Agitator, operating width of 745 cm</td>
<td>3</td>
<td>€ 10.000.00</td>
<td>€ 30.000.00</td>
</tr>
<tr>
<td>Pick-up press with adjustable chamber 100-150 cm</td>
<td>3</td>
<td>€ 39.750.00</td>
<td>€ 119.250.00</td>
</tr>
<tr>
<td>Pick-up press with fixed chamber 130 cm</td>
<td>2</td>
<td>€ 36.000.00</td>
<td>€ 72.000.00</td>
</tr>
<tr>
<td>Wrapper with catching fork</td>
<td>4</td>
<td>€ 17.250.00</td>
<td>€ 69.000.00</td>
</tr>
<tr>
<td>Self-discharge trolley for bales</td>
<td>4</td>
<td>€ 18.250.00</td>
<td>€ 73.000.00</td>
</tr>
<tr>
<td>Grain harvesters 275 hp with reaper</td>
<td>3</td>
<td>€ 261.000.00</td>
<td>€ 783.000.00</td>
</tr>
<tr>
<td>Sunflower reaper for the grain harvester</td>
<td>3</td>
<td>€ 44.750.00</td>
<td>€ 134.250.00</td>
</tr>
<tr>
<td>Corm reaper with stem cutter for the grain harvester</td>
<td>3</td>
<td>€ 44.250.00</td>
<td>€ 132.750.00</td>
</tr>
<tr>
<td>Transporting trolley for reaper</td>
<td>6</td>
<td>€ 7.000.00</td>
<td>€ 42.000.00</td>
</tr>
<tr>
<td>Silage harvester 707 hp with reaper</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8. Analysis of resources

8.1. Production facilities

The production facilities of the Company meet the main specifications for commercial dairy facilities: utility lines (gas, power, water), required capacity, no environmentally hazardous production, a tree line between the land plots, and an availability of agricultural land nearby to procure the fodder. The layout and dimensions of the main production and auxiliary facilities of the enterprise are designed taking into account all the requirements for this type of production. There are natural/forced ventilation and heating of all rooms.

Description of the project implementation area - the Voronezh region

Geographical location. The Voronezh region is located in the central part of the European part of Russia. The area of the region is 52.2 thousand sq.km, which is about one third of the total Black Earth Belt. The length of the region from north to south is 277.5 km and from west to east - 352 km. It borders Tambov, Saratov, Volgograd, Rostov, Belgorod, Kursk and Lipetsk regions, as well as Ukraine.

Climate. The Voronezh region is between 52˚ and 49˚ N in the temperate climatic zone. Summer is relatively hot, and winter is moderately cold. The features of the continental climate increase from north-west to south-east. The territory of the Voronezh region is almost all-year-round dominated by western disturbance and moderate air mass. The average annual air temperature is about 6 °C. The average July temperature is about 20.5 °C. The average temperature in January is about -9.4 °C. The annual amplitude of temperatures increases to the east of the region, thus reflecting increased presence of the continental climate features. The frost-free period lasts from 142-157 days in the north to 155-168 days in the south of the region. The average annual rainfall varies from 550 to 450 mm from north-west to south-east. Winds with western component prevail in the Voronezh region. The average annual wind speed is 3.3-5.2 m/sec.

Soils. About 80% of the Voronezh region is occupied by black soils, the most fertile soils of the Earth. These black soils are southern, ordinary, podsolized, typical, leached, alkali and meadow-black soils. Other types of soils present include floodplain soils, also of high fertility, as well as low-productivity sandy and saline soils, alkali soils and salt marshes.

The territory of the region is plowed up by 62.7%. According to the nature of soils, the territory can be divided into the forest-steppe part with typical, leached, podsolized black soils and steppe with southern and ordinary black soils. The soil cover depends on the height of the terrain. In the Oka-Don lowland, the features of soils depend on the basin relief. On the Central Russian Upland, a strong ruggedness of the relief enhances the variety of the soil cover.

Population. The population of the region according to Goskomstat of Russia is 2,334,800 people. (2015). The population density is 43.5 people per sq. km (2015). Urban population is 63.3% (2015). The share of rural population is significantly higher than the average for Russia and the Central Federal District: 36.7% vs. 26.9% in the Russian Federation and 19.3% in the district. The share of the gainfully employed population is about 50%. The average age of the employed population is 40.4 years (in the Russian Federation - 39.7 years, in the Central Federal District - 40.5 years). Distribution of the employed population according to the education: 25.9% - higher education, 36.1% - complete secondary (general) education and 23.1% - secondary vocational education. The number of unemployed citizens in the total
labor market of the Voronezh region accounted for 67.7% thousand people; total unemployment was 6.0%. The number of citizens employed in the economy was 1068.6 thousand people, the employment level being 60.6%. The unemployment rate in the registered sector of the labor market was 1.6% of the gainfully employed population. The number of unemployed citizens registered with the employment service bodies at the beginning of 2012 amounted to 18.0 thousand people.

Administrative division. There have been 534 municipalities since 2006 in the territory of the Voronezh region, including 3 urban districts, 31 municipal districts, 29 urban settlements, 471 rural settlements.

Industry. The Voronezh Region is one of the largest industrial centers of Russia, where manufacturers of a wide range of high-tech industrial products are concentrated - from line aircraft and rocket engines to rubber and mineral fertilizers. The region accounts for more than 20% of the total Russian production of synthetic rubber, about 9% electricity generated by nuclear power plants, 8.4% of motor tires, 18.6% of low-power electric motors, and 3.8% of mineral fertilizers. The share of the industrial complex of the Voronezh Region in the gross regional product is 23.1%. In total, 260 large and medium-sized industrial enterprises operate on the territory of the Voronezh Region, employing more than 142,000 people. According to the structure of the economy, the Voronezh Region is an industrial/agrarian region. The specialization of the region is the food industry (27%), the machine building and metal processing rank the second (23%), the third place is taken by the power generating industry (18%).

Transportation. The advantage of the region’s location is made by a hub of transport communications linking the region with other industrial regions of Russia and the CIS countries. The most important highways of "North-South" and "West-East" directions go through the region. Motor roads. The length of public hard surface motor roads is 12,479 km. Four federal highways pass through the Voronezh Region: M-4 “Don” (Moscow-Novorossiysk), M-6 “Kaspy” (Moscow-Astrakhan), A-144 (Kursk-Voronezh-Borisoglebsk-Saratov) and 1R-193 (Voronezh-Tambov). Railways in Voronezh. The direction of the South-Eastern Railway (branch of Russian Railways OJSC) is located in Voronezh. The operational length of public railways within the boundaries of the Voronezh Region is 1,149 km, including 700 km of electrified railways (60.9%). Air transport. Voronezh Airport has the status of an international airport since 1995 and is used as a reserve airport for the Moscow air hub. In addition to Moscow and other Russian cities, one can take a flight to Prague, Munich, Milan, Tel Aviv, Istanbul, Antalya, Podgorica, Kiev, Minsk and a number of other foreign destinations from Voronezh.

Agriculture. The main directions of the agricultural specialization in the region are the production of grain crops, sugar beet, sunflower, milk, eggs, cattle meat and pork. The agro-industrial complex of the Voronezh region gives 12% of the gross regional product. Over 15% of the working-age population of the region are employed in agriculture, and more than 30% of the region’s inhabitants live in rural areas. There are about 600 agricultural enterprises, 3,500 farming enterprises, more than 350 thousand personal subsidiary farms and 200 food and processing industry enterprises in the region. The region has 4 million ha of agricultural land, including 3 million ha of arable land. Areas under crops are sown with grains and legumes by 50%, technical crops by 23% and fodder crops by 13%. The Voronezh region is a major producer of livestock products. The region ranks the second in milk and meat production in the Central Federal District. The cattle amounted for 429.1 thousand animals, including 173.8 thousand of cows in all categories of farms. The share of food and processing industries is about 30 percent of the total industrial production in the region. The region occupies leading positions in the country for a number of products: 9.0% of vegetable oils and 13.0% of sugar of total Russian production are produced here.

Information on Khokholsky district
Geographical location. The administrative center is the industrial settlement Khokholsky located 38 km away from Voronezh. The total area of the district is 1,451 sq. km. There are 36 settlements in the district united into one urban and 14 rural settlements with a population of 29,814 people as of 01.01.2012. The district is crossed by federal highways "Voronezh-Lugansk" and "Kursk-Borisoglebsk"; there is also a railway line. A highway and a road bridge are built across the Don River on the territory of Borschchevsk rural settlement to connect the motorway "Kursk-Borisoglebsk" with the federal highway "Don" (Moscow-Voronezh-Rostov). There is a small aircraft airport in the Gremyachinsky rural settlement.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Meas. units</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>The share of the total number of profitable agricultural organizations</td>
<td>%</td>
<td>2009: 75.00, 2010: 64.71, 2011: 93.80, 2012: 94.10, 2013: 100, 2014: 100, 2015: 100</td>
</tr>
</tbody>
</table>

Agriculture. The share of agriculture in the gross product structure of the region is 58%. 39 enterprises pursue agricultural business: 17 agricultural enterprises, 22 farms and more than 13 thousand households.

Industry. The industrial production of the region is represented by 12 large and medium-sized enterprises and can be characterized as quite stable. The share of industrial production in the total gross output of the region is 41.6%. The region's industry is represented by the following enterprises: Khokholsky Sugar Mill LLC, Liquor Producer Visant OJSC, Finist LLC, State Unitary Enterprise VO Gremyachinsky Veterinary Sanitary Disposal Plant, Khokholsky Sand Pit CJSC, Promregion LLC, a branch of Voronezhs Dairy Plant OJSC - Khokholsky Dairy Plant.

Roads and transportation. The transport network of the district is represented by federal and regional highways and the railway mainline of the South-Caucasian Railway. The current state of roads is satisfactory; though capital repair and maintenance of some road sections are required.

Housing and utilities. Housing and utility services are provided by 10 enterprises, of which 8 are private property enterprises. All enterprises operate stably. There are uniform tariffs for all utility services consumers in the district.

Social and employment sphere. Labor resources of the region account for 14.1 thousand people. There are 11.1 thousand retired people, or 37.3% of the total population.

Consumer market. The trade services are rendered by 192 trade facilities, including 127 stores, 5 pavilions, 33 kiosks, 10 pharmacies and pharmacy branches, 17 food and beverage facilities. Food and beverage services are rendered by 17 facilities. Consumer services in the district are rendered by 25 facilities of various legal forms. There are services of car wash, tire fitting, dry cleaning of feather products rendered in the district.

3 http://www.hoholadm.ru
Information about land plots

The project initiators own land plots with a total area of about 3,600 ha of three categories: agricultural land, land for agricultural production, and land of settlements, about 1,300 ha of land leased. It is planned to lease up to 3,000 hectares more.

The site of the facility will be located on lands free from buildings and greenery. The plot meets the requirements of SanPiN 2.2.1/2.1.1.1200-03 for livestock enterprises on sanitary protection zones.

8.2. Material resources.

Fuel and lubricants. The following types of fuel and lubricants will be used in the production process:
- diesel fuel;
- gasoline;
- motor oils.

Structural subdivisions: machinery and tractor fleet and car fleet.

The fuel (mainly diesel fuel for agricultural machinery) will be used primarily for agrotechnical activities (plowing, sowing, harvesting, shipping), on-site movement (provision of fodder, manure removal, transportation of animals, milk transportation) and delivery of dairy products and meat to sales points.

The standards for fuel consumption are given below.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Area, ha</th>
<th>Yield, t/ha</th>
<th>Seeds, kg/ha</th>
<th>Seeds, price per 1 kg</th>
<th>Seeds, total annual expenses</th>
<th>Fertilizer type</th>
<th>Fertilizers, t/ha</th>
<th>Expenses for fertilizer, RUB/ha</th>
<th>Fuel and lubricants, RUB/year</th>
<th>PPA, RUB/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn (silage)</td>
<td>1,000</td>
<td>40</td>
<td>30</td>
<td>32</td>
<td>960,000</td>
<td>NPK + nitrate ammonia</td>
<td>0.1</td>
<td>5,200,000</td>
<td>6,400,000</td>
<td>1,500,000</td>
</tr>
<tr>
<td>Perennial grass</td>
<td>3,000</td>
<td>13</td>
<td>30</td>
<td>160</td>
<td>2,880,000</td>
<td>nitrate ammonia</td>
<td>0.2</td>
<td>9,000,000</td>
<td>8,640,000</td>
<td>300,000</td>
</tr>
<tr>
<td>Barley</td>
<td>1,600</td>
<td>4</td>
<td>220</td>
<td>15</td>
<td>5,280,000</td>
<td>NPK + nitrate ammonia</td>
<td>0.1</td>
<td>7,120,000</td>
<td>8,192,000</td>
<td>3,200,000</td>
</tr>
<tr>
<td>Wheat</td>
<td>700</td>
<td>4.8</td>
<td>220</td>
<td>16</td>
<td>2,464,000</td>
<td>NPK + nitrate ammonia</td>
<td>0.3</td>
<td>4,690,000</td>
<td>4,480,000</td>
<td>2,800,000</td>
</tr>
<tr>
<td>Corn</td>
<td>700</td>
<td>6</td>
<td>25</td>
<td>350</td>
<td>6,125,000</td>
<td>NPK + nitrate ammonia</td>
<td>0.15</td>
<td>3,885,000</td>
<td>4,480,000</td>
<td>2,800,000</td>
</tr>
</tbody>
</table>

Table 14. Consumption of fuel and lubricants for crop production

Energy resources. The following types of energy resources will be used in the production process:
- electric power;
- heat power (natural gas);
- water supply for drinking and process needs;

Source: data of the Project Initiator, calculations of the Project's financial adviser
- water disposal (treatment of process and sewer water).
The need for energy resources for the main production was taken into account either as the resource annual consumption per a facility or per unit of output.
The need for energy resources for auxiliary production was taken into account without a breakdown by categories in the amount of the annual resource consumption.

Table 18

Consumption of power, natural gas, water, sewage, power loads
Aggregated loads for power, gas, and water

<table>
<thead>
<tr>
<th></th>
<th>Electric power</th>
<th>Gas</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Farm</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P established (P est.)</td>
<td>1,394 kW</td>
<td>926 kW</td>
<td>2,190 m³/year</td>
</tr>
<tr>
<td>P rated (P rat.)</td>
<td>926 kW</td>
<td>0.046 thousand TFOE/year</td>
<td>6.0 m³/day</td>
</tr>
<tr>
<td>I rated (I rat.)</td>
<td>1,416 A</td>
<td>0.096 thousand m³/h</td>
<td></td>
</tr>
<tr>
<td>Annual</td>
<td>4,120 thousand kW/h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hourly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Elevator / Mixed fodder plant</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P established (P est.)</td>
<td>933 kW</td>
<td>620 kW</td>
<td>2,190 m³/year</td>
</tr>
<tr>
<td>P rated (P rat.)</td>
<td>620 kW</td>
<td>0.067 thousand TFOE/year</td>
<td>6.0 m³/day</td>
</tr>
<tr>
<td>I rated (I rat.)</td>
<td>936 A</td>
<td>0.550 thousand m³/h</td>
<td></td>
</tr>
<tr>
<td>Annual</td>
<td>1,629 thousand kW/h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hourly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FMD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P established (P est.)</td>
<td>250 kW</td>
<td>200 kW</td>
<td>864 m³/year</td>
</tr>
<tr>
<td>P rated (P rat.)</td>
<td>200 kW</td>
<td>0.103 thousand TFOE/year</td>
<td>3.0 m³/day</td>
</tr>
<tr>
<td>I rated (I rat.)</td>
<td>310 A</td>
<td>0.044 thousand m³/h</td>
<td></td>
</tr>
<tr>
<td>Annual</td>
<td>526 thousand kW/h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hourly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P established (P est.)</td>
<td>2,577 kW</td>
<td>1,746 kW</td>
<td>5,244 m³/year</td>
</tr>
<tr>
<td>P rated (P rat.)</td>
<td>1,746 kW</td>
<td>0.616 thousand TFOE/year</td>
<td>15.0 m³/day</td>
</tr>
<tr>
<td>I rated (I rat.)</td>
<td>2,662 A</td>
<td>0.69 thousand m³/h</td>
<td></td>
</tr>
<tr>
<td>Annual</td>
<td>6,275 thousand kW/h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hourly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: data of the Project Initiator, calculations of the Project’s financial adviser

Field cultivation. The resource consumption by volume in field cultivation depends on the cultivated area and the standards of resource consumption, which were adopted in accordance with process maps of growing fodder crops as per farming conditions in the Voronezh region.
The calculation was made for the following crops:
- grain fodder wheat;
- grain fodder corn;
- silage corn;
- haylage grass;
- hay grass;
- root crops.

Livestock production.  
Fodder, litter and drinking water for animals. The consumption of coarse fodder and additives, litter straw and drinking water was calculated taking into account the recommended daily feeding doses and the number of animals served in each phase of the calculation period in accordance with the herd movement schedule.
Coarse fodder for the production is provided by means of own field cultivation activities.

Artificial insemination, veterinary products and disinfectants. The need for consumables for artificial insemination was calculated:
- at the CDF, based on the rate of two doses for one artificial insemination, and the ratio of re-insemination at 20% (first-calf cows), 30% (cows).
The need for medicines for disease prevention and treatment of animals, as well as disinfectants is determined in value terms in relation to the planned livestock as per the herd movement schedule. Vaccination, veterinary care and disinfection of cow houses are carried out during the entire period of animal housing.

**Death losses.** Death losses at the CDF were taken in accordance with standard death numbers for certain groups of animals according to the herd movement schedule.

**Cattle productivity factors at the CDF:**
- Feeding with complete fodders prepared in strict compliance with the productivity and a phase of the animal biological cycle of each process group;
- Provision of clean, heated drinking water for the cattle;
- Improved environment by means of natural ventilation with inflow through light-air vents in the roof without heating up the inflowing air;
- Establishing comfortable conditions for animals to rest, which increases productivity (a cow deprived of one hour of rest is considered to lose 2 liters of milk);
- Improved veterinary care for animals using modern information technologies, sanitary zones near the milking parlor, furnished with all equipment necessary for the operator;

**Milk quality factors:**
- Automated maintenance of the required milking modes and timely removal of milking machines;
- A short path of milk from the udder to the milk tank;
- Rapid cooling of milk to 4 °C and automated maintenance of this temperature during storage;
- Automated washing of all milking equipment.

**Reproduction factors:**
- Reduced period of service, and consequently, of the entire inter-calving cycle of the cow;
- Increased yield of calves and reduction of their mortality;
- Increased period of productive use of cows;
- Reduced number of culled cows compared to the usual level and, as a result, reduced cost of growing heifers.
9. Environmental impact of the Project

Production processes, the equipment used in production and production principles comply with international standards and the Russian legislation. The world and Russian experience of locating similar enterprises in populated areas show there are no factors of harmful impact on the environment and the health of the population of the neighboring areas.

According to the construction rules and regulations SNiP II-97-76 "General plans of agricultural enterprises", the designed livestock facilities belong to the class of enterprises with a sanitary protection zone of over 500 m, which is possible to organize in the Project.

Sanitary veterinary requirements to livestock facilities

In accordance with the main provisions for designing livestock facilities (ST SEV 3975-83 "Livestock, poultry and fur farming buildings"), sanitary and veterinary standards were met as early as at the design stage of the Project:

- sanitary and hygienic isolation of the production zone is provided to ensure an effective protection mode against pathogens of animal diseases and fowl;
- the buildings are designed with enclosing structures with heat-insulating properties. The necessity of heating the building is determined based on the estimated parameters of indoor and outdoor air, heat, moisture and gas emissions in the premises, heat of solar radiation and heat loss through the enclosing structures.
A deep trench is provided along the entire perimeter of the facility. The entrance is equipped with a disinfecting barrier.

The waste collection area is enclosed from three sides with a blind 1.5 m high concrete or brick wall (as per SanPiN 2.3.4.551). The Projects also provides for waste removal from the waste collection containers at least once a day, followed by sanitary treatment and disinfection of containers and the area (as per SanPiN 2.3.4.551).

Milk processing enterprises must meet the requirements for the sanitary protection of the environment in accordance with the following main regulatory documents:
- SanPiN "Hygienic requirements for the protection of the atmosphere in populated areas";
- SanPiN "Sanitary rules and regulations for protection of surface water from pollution";
- Sanitary rules "The procedure of accumulation, transportation, decontamination and burial of toxic industrial wastes", etc. (as per SanPiN 2.3.4.551).

Sewerage of the enterprise can be connected to the sewerage networks of populated areas or have its own system of treatment facilities. When discharging to sewer treatment plants of the settlements, the conditions for wastewater discharge are determined by "Regulations for the acceptance of industrial sewage into the sewage system of settlements". In addition to own treatment facilities, the conditions for the discharge of treated sewage are determined by the "Sanitary Rules and Regulations for the Protection of Surface Waters from Pollution" (as per SanPiN 2.3.4.551-96).

Contamination of general sewage water is determined as per "Indicators of sewage contamination of dairy enterprises" or as per calculation. "Methodological Guidelines for Determining Estimated Contamination of the Sewage" (as per the VSTP-6.01) shall be taken as the basis.
Solid waste products shall be collected in metal bins and containers and removed to a sanitary landfill.

The sources of environmental pollution are:

- spent detergents and disinfecting solutions;
- rinse water of dairy products;
- waste of PE packaging, cardboard die-cutting
- waste of corrugated cardboard, plastic containers
- other wastes.

Spent detergents and disinfecting solutions are to be neutralized in the baths for the solution preparation to a pH of 6.5-8.5 before their discharge into the industrial sewerage.

**Disposal of production waste**

Prohibited chemical reagents and substances are not used in the production process. Additionally, all emissions to the environment are subject to deep purification at the stipulated and projected treatment facilities and filtration plants. The production does not involve dust generation. Household waste and sewage are also disposed of at solid waste landfills and in treatment plants. Wastes generated in the production of drinking milk are, in general, belong to hazard classes IV and V (low risk and practically not dangerous). Therefore, the waste generated at the designed facilities will not affect the pollution of the surrounding environment.

**Disposal of manure.** The main problem in the implementation of large livestock projects is the disposal of manure. Manure is an environmentally friendly organic fertilizer, which if used on farmland will ensure the restoration and increase of natural fertility of soils. After setting out in the lagoons, manure will be removed to own agricultural lands of the enterprise to improve the fertility of the land.

**Removal of manure from cow-houses.** All animals on the farm are kept loosely, therefore, in all rooms (except for the milking room where the manure is removed to the central manure channel with the water wash), manure is removed from the manure passages by an automatic scraper with an electromechanical chain drive into the central manure channel.

**Specification and technical characteristics of the scraper unit: - where is it?**

**Process wastewater treatment**

Process wastewater will be treated at a designed local treatment plant. Domestic sewage and purified process water is planned to be discharged to designed biological treatment facilities that will be located outside the site and then into the domestic sewerage system. Storm sewage will be delivered to the designed treatment facilities of surface runoff. Domestic and process wastewater will not affect the pollution of surface waters, as there is no discharge to surface water bodies, nor groundwater pollution, since there are measures stipulated in the project to prevent groundwater pollution.
10. **Finance preconditions and results.**

**Project payback and main risks**

10.1. **Main source data, assumptions and preconditions**

Input parameters and forecasts are based on data:

1. From public sources:
   a. Forecast of long-term social and economic development of the Russian Federation for the period until 2030⁴;
   b. Data of the Federal State Statistics Service of Russia (Rosstat).

2. 2. KhSK LLC (hereinafter referred to as the "Customer"):
   a. Preliminary report on the Project;
   b. Preliminary data on the cost of construction and equipment, volumes of production and sales, operating costs, and required staff;

3. Center for Modern Management Technologies (hereinafter - CMMT):
   a. similar projects;
   b. opinions and forecasts of experts.

The evaluation of the Project performance was based on indicators and factors that meet the requirements of the Ministry of Economic Development of the Russian Federation, including Order No. 493 dated October 30, 2009 "On approving the methodology for calculating indicators and applying criteria for the performance of investment projects claiming to receive state support from the investment fund of the Russian Federation "(hereinafter referred to as the" Methodology ").

The forecast is based on the assumption that the Project Initiator will continue its operational activities in the future as per the specialization and does not take into account the possibility of changing the specialization or technology, as well as the termination of activity in any period. The financial model gives values of quarterly cash flows. The Business Plan provides annual values of cash flows.

The projected financial reports and project performance indicators in the business plan were calculated on the basis of the annual values of cash flows in nominal prices. Capital investments are indicated in nominal prices.

**Forecast period**

The forecast period is 15 years: from 2017 to 2031.

Performance indicators are calculated with taking into account the forecast and post-forecast periods. The forecasting interval is equal to 1 month.

The financial model shows monthly cash flows and aggregated values by years.

The project performance indicators were calculated on the basis of annual cash flow values.

**Cash flow**

**In nominal / real terms**

Depending on the taking in account the inflation, there are distinguished:

- nominal cash flow;
- real cash flow.

If nominal cash flow was forecast, then the discount rate used should be calculated in nominal terms (with taking into account inflation); if real cash flow was forecast, then the discount rate should be calculated in real terms (without inflation).

The cash flow forecast of the Project was carried out in nominal terms.

On equity/investment capital. The cash flow may be based:
- on equity;
- on invested capital.
The weighted average cost of capital (WACC) is used as the discount rate to calculate the cash flow on the invested capital. When calculating the cash flow on equity, the capital assets pricing model (CAPM) is used as the discount rate.
The business plan considers the cash flow forecasts for the invested and for equity capital.
In order to calculate the project performance indicators, cash flow was forecast for invested capital. In order to calculate the use/repayment of loans, cash flow was forecast for equity capital.

Cash flow currency
The cash flow can be accounted for in any currency; the discount rate used must be calculated in the same currency as the cash flow. The project cash flow was forecast in rubles.

Continuity of activity
The forecast is based on the assumption that the Project Initiator will continue its operational activities in the future as per the specialization and does not take into account the possibility of changing the specialization or technology, as well as the termination of activity in any period.
The long-term growth rate of cash flow in the post-forecast period is the average annual rate of inflation.

Capital expenses
Initial investments to the construction of buildings and structures, as well as to the process equipment of the facilities were taken on the basis of data provided by the Project Initiator. Planned capital investments are given in nominal prices. When accounting for capital investments, the cost of delivery, installation and commissioning of process equipment, as well as VAT and customs duties were taken into account.

Volume of production and selling price
The production volumes were forecast according to the optimistic scenario taking into account the influence of external and internal factors, the maximum capacity utilization being 100%. The achievement of the designed capacity is planned in early 2019.
Prices for products are formed on the basis of the planned cost as per data by the Project Initiator, taking into account the current situation on the market, i.e. accounting for the consumer demand and prices of competitors. The product output is calculated on the basis of the production capacity.

Macroeconomic assumptions
"Forecast of long-term social and economic development of the Russian Federation for the period until 2030" was used as source data for the macroeconomic forecasting.

<table>
<thead>
<tr>
<th>Table 8 Macroeconomic assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macroeconomic assumptions</td>
</tr>
<tr>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Indices used by the model to account for the inflation</td>
</tr>
<tr>
<td>Consumer price index (CPI);</td>
</tr>
<tr>
<td>Electric power;</td>
</tr>
<tr>
<td>Labor compensation;</td>
</tr>
<tr>
<td>Producer price index (PPI);</td>
</tr>
<tr>
<td>Housing and utility;</td>
</tr>
<tr>
<td>Capital investments deflator.</td>
</tr>
</tbody>
</table>

The main macroeconomic indicators are calculated on the basis of a conservative scenario characterized by moderate long-term economic growth rates based on active modernization of the fuel and energy and raw materials sectors of the Russian economy while maintaining structural barriers in the development of human capital, transport infrastructure, and civil high and medium-technology sectors.
Business Plan for construction of a livestock (milk) facility in the Voronezh Region

Table 9 Forecast macroeconomic indicators

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial production index, % (average annual)</td>
<td>5.9 %</td>
<td>3.9 %</td>
<td>3.5 %</td>
<td>2.3 %</td>
<td>3.0 %</td>
<td>3.0 %</td>
<td>3.5 %</td>
<td>3.0 %</td>
<td>2.9 %</td>
<td>2.4 %</td>
<td>2.2 %</td>
<td>3.9 %</td>
</tr>
<tr>
<td>Price index of industrial goods, % (average annual)</td>
<td>8.7 %</td>
<td>3.3 %</td>
<td>3.2 %</td>
<td>4.7 %</td>
<td>3.0 %</td>
<td>3.6 %</td>
<td>2.7 %</td>
<td>2.7 %</td>
<td>2.6 %</td>
<td>2.5 %</td>
<td>2.4 %</td>
<td>4.5 %</td>
</tr>
<tr>
<td>Consumer price index, % (average annual)</td>
<td>4.5 %</td>
<td>4.1 %</td>
<td>3.6 %</td>
<td>3.2 %</td>
<td>2.8 %</td>
<td>2.7 %</td>
<td>2.7 %</td>
<td>2.5 %</td>
<td>2.3 %</td>
<td>2.2 %</td>
<td>2.0 %</td>
<td>4.3 %</td>
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<tr>
<td>USA inflation (CPI), %, in USD</td>
<td>1.8 %</td>
<td>2.0 %</td>
<td>2.0 %</td>
<td>2.1 %</td>
<td>2.0 %</td>
<td>1.9 %</td>
<td>2.0 %</td>
<td>2.0 %</td>
<td>2.0 %</td>
<td>2.0 %</td>
<td>2.0 %</td>
<td>1.8 %</td>
</tr>
<tr>
<td>Electric power</td>
<td>3.1 %</td>
<td>3.8 %</td>
<td>3.7 %</td>
<td>3.5 %</td>
<td>2.8 %</td>
<td>2.7 %</td>
<td>2.7 %</td>
<td>2.7 %</td>
<td>2.7 %</td>
<td>2.6 %</td>
<td>3.6 %</td>
<td>5.1 %</td>
</tr>
<tr>
<td>Gas</td>
<td>4.6 %</td>
<td>4.6 %</td>
<td>4.5 %</td>
<td>4.0 %</td>
<td>3.5 %</td>
<td>3.1 %</td>
<td>2.9 %</td>
<td>2.8 %</td>
<td>2.7 %</td>
<td>2.5 %</td>
<td>2.3 %</td>
<td>4.6 %</td>
</tr>
<tr>
<td>Fuel</td>
<td>7.2 %</td>
<td>4.2 %</td>
<td>3.8 %</td>
<td>2.5 %</td>
<td>3.0 %</td>
<td>3.1 %</td>
<td>3.0 %</td>
<td>3.1 %</td>
<td>3.0 %</td>
<td>3.0 %</td>
<td>3.0 %</td>
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<tr>
<td>Rated salary</td>
<td>5.5 %</td>
<td>4.0 %</td>
<td>3.6 %</td>
<td>3.6 %</td>
<td>3.6 %</td>
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<td>3.6 %</td>
<td>3.6 %</td>
<td>3.6 %</td>
<td>2.2 %</td>
<td>3.2 %</td>
<td>2.4 %</td>
</tr>
<tr>
<td>Milk</td>
<td>7.0 %</td>
<td>4.5 %</td>
<td>4.1 %</td>
<td>3.6 %</td>
<td>3.3 %</td>
<td>3.1 %</td>
<td>2.9 %</td>
<td>2.7 %</td>
<td>2.6 %</td>
<td>2.4 %</td>
<td>2.3 %</td>
<td>7.0 %</td>
</tr>
</tbody>
</table>

Source: data of the Project Initiator, calculations of the Financial adviser

Sales prices and sales proceeds

Prices for manufactured products are formed on the basis of prices established in the market for similar products, focusing on consumer demand and the prices of competitors. Initial prices for the model are taken as the minimum selling prices of competitors for similar products as of October 2015. The prices in the forecast period were indexed for the projected increase rate taking into account domestic inflation and changes in prices for primary commodities.

For the purposes of calculation, the forecast of all prices was carried out without VAT.

Initial prices of the product sales (with VAT):
- Raw milk - 24 rub/L
- Marketable cattle (bulls) - 200 rub/kg
- Breeding livestock (heifers of 18 months and older) - 380 rub/kg
- Culled cows - 100 rub/kg

The Project also stipulates additional income in the form of rendering services for storage and drying of grain and sunflower

Floating assets

When calculating the need for floating assets, the following parameters were used, based on the specifics of the plant operation.

- Stocks of raw materials: for the purpose of calculations, the periodicity of materials and components for repair and maintenance needs was assumed to be 30 days.
- Unfinished products and stocks of finished products in the warehouse: for the model calculations, the shipment of products was assumed to be every ten days.
- Accounts receivable: the calculations used the assumption that 50% of the products are shipped to buyers with a prepayment, 50% are sales on credit. The average credit term is 30 days.
- Advance payments to suppliers: the share of material resources received on prepayment is 50%.
- Accounts payable: the share of material resources received without prepayment is 50%. The deferred payment is assumed to be 30 days.
- Advance payments of buyers: the share of products shipped with an advance payment is 50%.
- Settlements with employees: The salary of employees is paid 2 times a month.

Personnel

The staff schedule of the plant for the production personnel is compiled on the basis of the data by the project initiator. According to the staff schedule, the project personnel will include 136 people.

Tax assumptions
The calculation model of the project under consideration adopted the rates of taxes and deductions to the budget as per the current legislation in the Russian Federation. The following types of taxes were taken into account in the calculations to analyze the financial and economic performance of the project:

### Table 10 Tax assumptions

<table>
<thead>
<tr>
<th>Tax assumptions</th>
<th>Rate</th>
<th>Federal budget</th>
<th>Regional budget</th>
<th>Local budget</th>
<th>Non-budgetary funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate income tax rate for the agricultural products</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corporate income tax for other types of activity</td>
<td>20.0%</td>
<td>2.0%</td>
<td>18.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAT</td>
<td>10.0%</td>
<td>100.0%</td>
<td>18.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>18.0%</td>
<td>100.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Property tax</td>
<td>0.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>100.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land tax for agri-businesses</td>
<td>0.3%</td>
<td></td>
<td></td>
<td>100.0%</td>
<td></td>
</tr>
<tr>
<td>Personal income tax</td>
<td>13.0%</td>
<td>30.0%</td>
<td>70.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insurance payments (unified social tax)</td>
<td>30.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Corporate income tax**

The object of taxation with the corporate income tax is recognized as income received, reduced by the amount of expenses incurred, which are determined in accordance with the data of tax accounting.

The tax rate on the corporate income of agricultural organizations is 0%.

**Insurance payments**

The object of taxation with insurance payments for payers of insurance premiums, who make payments and other remunerations to individuals.

**Property tax**

The object of taxation with the property tax is movable and immovable property (including property transferred to temporary possession, use, disposal or trust management, contributed to joint activities), recorded on the balance sheet of the organization as fixed assets.

The tax base is defined as the average annual value of the property, which is recorded at the depreciated value, formed in accordance with the accounting policy data of the organization.

In accordance with the Tax Code, the property tax rate is 0%.

**Value Added Tax (VAT)**

The object of taxation with the value-added tax is recognized as transactions related to the sale (transfer) of goods (the performance of work, the provision of services), including for own needs, the performance of construction and installation work for own consumption and the import of goods into the customs territory of the Russian Federation.

The tax base is determined on the basis of all incomes of the taxpayer associated with settlements for the payment of said goods (works, services) and received in cash and (or) in kind.

The rates of value added tax: 0% (the list is given in Article 164, clause 1), 10% (the list is given in Article 164, clause 2), all other cases - 18%.
The tax period for the tax is set as a quarter. Payment of the tax is made on the basis of the results of each tax period based on the actual sale (transfer) of goods (works, services) for the expired tax period in equal shares not later than on the 20th day of each of the three months following the expired tax period.

**Land tax**

Taxpayers are organizations and individuals who possess land plots on the right of ownership, the right of permanent (unlimited) use or the right of lifetime inheritable possession.

The object of taxation is recognized as land plots located within the municipality where the tax is imposed.

The tax base is determined for each land plot as its cadastral value as of January 1st of the year of the tax period.

### 10.2. Project financing

The total cost of the project amounts to RUB 5,016 mn, including:

- investments in capital assets - RUB 4,939 mn;
- investments in floating assets - RUB 77 mn;

Sources of the project funding:

- own funds RUB 1,003 mn (20% of the project cost), of which RUB 670 mn is already invested to the project; RUB 333 mn - future expenses
- borrowed funds of RUB 4,013 mn (80% of the project cost); of which Government subsidies - RUB 596 mn (refinancing of loaned funds after the facilities are entered in the Borrower’s books)
- for a partial reimbursement of direct incurred expenses for construction and modernization of facilities - as per Decree of the Government of the Russian Federation No. 624 dated June 24, 2015;
- **SUBSIDIES FROM THE REGIONAL BUDGET TO ORGANIZATIONS IMPLEMENTING SPECIALLY IMPORTANT INVESTMENT PROJECTS** - Decree of the Voronezh Region No. 153 dated March 16, 2015;
- for the purchase of breeding stock - Decree of the Government of the Voronezh region No. 203 dated March 30, 2015;
- a partial reimbursement of the cost of maintaining the breeding stock - Decree of the Government of Voronezh region No. 203 dated March 30, 2015

<table>
<thead>
<tr>
<th>Facility</th>
<th>with VAT</th>
<th>without VAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction and installation works</td>
<td>2,091,644</td>
<td>1,772,579</td>
</tr>
<tr>
<td>Equipment</td>
<td>1,561,274</td>
<td>1,323,114</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>100,300</td>
<td>85,000</td>
</tr>
<tr>
<td>Animals</td>
<td>534,374</td>
<td>534,374</td>
</tr>
<tr>
<td>Own funds</td>
<td>650,979</td>
<td>551,677</td>
</tr>
<tr>
<td>Fixed assets</td>
<td>77,415</td>
<td>65,606</td>
</tr>
<tr>
<td></td>
<td>5,015,987</td>
<td>4,332,351</td>
</tr>
</tbody>
</table>

*Source: data of the Project Initiator, calculations of the Project's financial adviser*
10.2.1. Expenses

The costs associated with the production and sale of products represent a valuation of raw materials, fuel, energy, fixed assets, labor and other expenses used in the production and sale of products. Expenses for labor remuneration of workers directly engaged in production are accounted for as a part of direct expenses. Operating costs are calculated on the basis of the source data by the Project Initiator. Calculation of operating costs is grouped by production sites (process conversion stages). When calculating the forecast financial statements in the forecast period, the operating costs were calculated in nominal terms taking into account inflation.

Other general business expenses include: security expenses, office maintenance costs (utilities and operation costs), staff recruitment and training, travel expenses, mail services, acquisition of reference books and strict accounting forms, hospitality within the established limits, banking and audit services and etc.

When calculating the forecast financial statements in the forecast period, the calculations were in nominal terms taking into account inflation.

When forecasting costs, the following assumptions were made:
- the expenses were calculated in nominal terms, taking into account inflation;
- the expenses in foreign currency were adjusted for the forecast exchange rate;
- the expenses were calculated without VAT.

<table>
<thead>
<tr>
<th>Commercial and administrative expenses</th>
<th>0</th>
<th>26,718</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel training and advance training</td>
<td>170</td>
<td></td>
</tr>
<tr>
<td>Food</td>
<td>1,730</td>
<td></td>
</tr>
<tr>
<td>Reimbursement of mobile communication cost</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>Financial assistance</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Travel expenses</td>
<td>560</td>
<td></td>
</tr>
<tr>
<td>Hospitality</td>
<td>480</td>
<td></td>
</tr>
<tr>
<td>Communication expenses</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>Internet</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Insurance</td>
<td>570</td>
<td></td>
</tr>
<tr>
<td>Information and consultations</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Other expenses</td>
<td>1,100</td>
<td></td>
</tr>
<tr>
<td>Marketing expenses for 2014</td>
<td>15,000</td>
<td></td>
</tr>
<tr>
<td>Repair of buildings</td>
<td>850</td>
<td></td>
</tr>
<tr>
<td>Deratization</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Disinfection</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Repair and maintenance of equipment</td>
<td>420</td>
<td></td>
</tr>
<tr>
<td>Repair of motor vehicles and machinery</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>Rent</td>
<td>4,658</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable production expenses</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Forage base</td>
<td>8,196</td>
</tr>
<tr>
<td>Crop rotation</td>
<td>742</td>
</tr>
<tr>
<td>Basic materials</td>
<td>305</td>
</tr>
<tr>
<td>Animal protection means</td>
<td></td>
</tr>
<tr>
<td>Insemination</td>
<td></td>
</tr>
<tr>
<td>Elevator and KPK</td>
<td></td>
</tr>
<tr>
<td></td>
<td>thousand RUB per month</td>
</tr>
<tr>
<td>--------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td><strong>Consumables and accessories</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Fuel and power resources</strong></td>
<td></td>
</tr>
<tr>
<td>Electric power</td>
<td>2,592</td>
</tr>
<tr>
<td>Gas</td>
<td>301</td>
</tr>
<tr>
<td>Fuel and lubricants</td>
<td>706</td>
</tr>
</tbody>
</table>
10.2.2. Capital investments

Initial investments to the construction of buildings and structures, as well as to the process equipment of the facilities were taken on the basis of data provided by the Project Initiator. The planned capital investments are given in nominal prices (taking into account the forecast inflation of the corresponding costs).

When forecasting the capital investments, the cost of delivery, installation and commissioning of process equipment, as well as VAT and customs duties were taken into account. The forecast of capital investments was based on the following data:
- cost estimates for the construction of facilities;
- budget proposals from equipment suppliers;
- calculations and assessments of the Project Initiator.

If the initiator has no contract for supply of process equipment, the Financial Consultant used budget proposals from potential suppliers. In this case, the proposed basic contract price was further adjusted taking into account the forecast inflation rate of the corresponding costs. For example, the cost of equipment and vehicles manufactured in the EU countries accounted for a projected rate of inflation in the EU and changes of the exchange rate.

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</tr>
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<td>65,606</td>
</tr>
<tr>
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<td><strong>5,015,987</strong></td>
<td><strong>4,332,351</strong></td>
</tr>
</tbody>
</table>

Source: data of the Project Initiator, calculations of the Project's financial adviser

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10.2.3. Floating assets

The change in own floating assets (OFA) reflects a temporary mismatch in the inflow and outflow of cash. The change of OFA change was calculated as follows:
- calculation of floating assets;
- calculation of accounts payable;
- calculation of the need for own floating assets;
- calculation of changes in own floating assets.

Floating assets were calculated using a direct method. Floating assets is the amount of cash advanced to the following balance sheet items for a particular period:
- stocks of raw materials and materials;
- animals of the growing stock and feeding stock;
- costs for the incomplete production;
- finished goods and goods for resale;
- receivables.

10.3. Income forecast: operating and financial results
### Profit and Loss Statement

<table>
<thead>
<tr>
<th>Year</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
<th>2026</th>
<th>2027</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Revenue</strong></td>
<td>212,122</td>
<td>666,676</td>
<td>792,101</td>
<td>831,948</td>
<td>859,350</td>
<td>884,982</td>
<td>909,547</td>
<td>933,662</td>
<td>956,955</td>
<td>979,658</td>
<td></td>
</tr>
<tr>
<td>1. Milk</td>
<td>0</td>
<td>144,364</td>
<td>501,438</td>
<td>320,646</td>
<td>549,526</td>
<td>567,060</td>
<td>384,019</td>
<td>600,318</td>
<td>616,199</td>
<td>631,548</td>
<td>646,360</td>
</tr>
<tr>
<td>2. Meat</td>
<td>0</td>
<td>4,903</td>
<td>64,798</td>
<td>166,594</td>
<td>172,319</td>
<td>175,818</td>
<td>183,133</td>
<td>198,249</td>
<td>195,228</td>
<td>198,043</td>
<td>202,688</td>
</tr>
<tr>
<td>3. Grain storage services</td>
<td>0</td>
<td>63,849</td>
<td>100,414</td>
<td>104,860</td>
<td>110,103</td>
<td>114,472</td>
<td>117,826</td>
<td>120,980</td>
<td>124,173</td>
<td>127,364</td>
<td>130,699</td>
</tr>
<tr>
<td>Constant</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Gross profit</strong></td>
<td>116,126</td>
<td>371,701</td>
<td>485,808</td>
<td>512,409</td>
<td>527,297</td>
<td>542,521</td>
<td>557,425</td>
<td>571,714</td>
<td>585,531</td>
<td>598,629</td>
<td></td>
</tr>
<tr>
<td><strong>Costs and expenses</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Amortization</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Amortization</strong></td>
<td>156,461</td>
<td>-481,917</td>
<td>-407,506</td>
<td>-346,494</td>
<td>-296,238</td>
<td>-254,645</td>
<td>-220,054</td>
<td>-191,142</td>
<td>-166,854</td>
<td>-146,346</td>
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</tr>
<tr>
<td><strong>EBIT</strong></td>
<td>42,356</td>
<td>-111,065</td>
<td>75,275</td>
<td>162,003</td>
<td>225,004</td>
<td>279,673</td>
<td>327,058</td>
<td>368,189</td>
<td>404,412</td>
<td>436,292</td>
<td></td>
</tr>
<tr>
<td><strong>EBITDA</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Interest expenses</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Profit before taxation</strong></td>
<td>42,356</td>
<td>-202,480</td>
<td>43,062</td>
<td>134,989</td>
<td>203,241</td>
<td>263,214</td>
<td>315,956</td>
<td>362,497</td>
<td>403,612</td>
<td>436,292</td>
<td></td>
</tr>
<tr>
<td><strong>Profit margin before taxation</strong></td>
<td>0%</td>
<td>-20%</td>
<td>0%</td>
<td>10%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td><strong>Corporate income tax</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Taxable income</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Income tax</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Pre-tax income</strong></td>
<td>42,356</td>
<td>-202,480</td>
<td>43,062</td>
<td>134,989</td>
<td>203,241</td>
<td>263,214</td>
<td>315,956</td>
<td>362,497</td>
<td>403,612</td>
<td>436,292</td>
<td></td>
</tr>
<tr>
<td><strong>Carry forward of losses</strong></td>
<td>0</td>
<td>42,356</td>
<td>244,835</td>
<td>203,773</td>
<td>66,784</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td><strong>Accumulated loss at the year start</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Accumulated loss at the year end</strong></td>
<td>42,356</td>
<td>244,835</td>
<td>203,773</td>
<td>66,784</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Profit margin after taxation</strong></td>
<td>0%</td>
<td>-20%</td>
<td>0%</td>
<td>10%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td><strong>Reinvestment of profits</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Dividends Payable</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Net profit ratio</strong></td>
<td>0%</td>
<td>-20%</td>
<td>0%</td>
<td>10%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td><strong>Unappropriated profits/(loss) at the end of period</strong></td>
<td>- (42,356)</td>
<td>(244,835)</td>
<td>(201,773)</td>
<td>66,784</td>
<td>136,488</td>
<td>399,671</td>
<td>715,627</td>
<td>1,078,125</td>
<td>1,481,737</td>
<td>1,918,029</td>
<td></td>
</tr>
</tbody>
</table>
## CASH FLOW STATEMENT

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cash flow from operations</strong></td>
<td>-68,787</td>
<td>153,476</td>
<td>316,327</td>
<td>499,672</td>
<td>534,194</td>
<td>548,508</td>
<td>562,506</td>
<td>576,219</td>
<td>589,246</td>
<td>601,968</td>
<td>614,017</td>
</tr>
<tr>
<td><strong>Direct calculation method</strong></td>
<td>-68,787</td>
<td>153,476</td>
<td>316,327</td>
<td>499,672</td>
<td>534,194</td>
<td>548,508</td>
<td>562,506</td>
<td>576,219</td>
<td>589,246</td>
<td>601,968</td>
<td>614,017</td>
</tr>
<tr>
<td>Earnings from operating business, with VAT</td>
<td>0</td>
<td>180,465</td>
<td>712,226</td>
<td>880,450</td>
<td>900,789</td>
<td>933,564</td>
<td>959,592</td>
<td>986,362</td>
<td>1,012,518</td>
<td>1,037,976</td>
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<tr>
<td>Miscellaneous income and expenses</td>
<td>0</td>
<td>17,606</td>
<td>59,591</td>
<td>60,822</td>
<td>60,822</td>
<td>60,822</td>
<td>60,822</td>
<td>60,822</td>
<td>60,822</td>
<td>60,822</td>
<td>60,822</td>
</tr>
<tr>
<td><strong>Indirect calculation method</strong></td>
<td>-68,787</td>
<td>153,476</td>
<td>316,327</td>
<td>499,672</td>
<td>534,194</td>
<td>548,508</td>
<td>562,506</td>
<td>576,219</td>
<td>589,246</td>
<td>601,968</td>
<td>614,017</td>
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<td>Corrections</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>Amortization return</td>
<td>0</td>
<td>156,461</td>
<td>481,917</td>
<td>407,506</td>
<td>346,494</td>
<td>296,238</td>
<td>254,645</td>
<td>220,054</td>
<td>191,142</td>
<td>166,854</td>
<td>146,346</td>
</tr>
<tr>
<td>Interest repayment</td>
<td>0</td>
<td>91,414</td>
<td>32,212</td>
<td>27,014</td>
<td>21,763</td>
<td>16,459</td>
<td>11,102</td>
<td>5,692</td>
<td>800</td>
<td>0</td>
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<tr>
<td>Investments in floating assets</td>
<td>-68,787</td>
<td>37,773</td>
<td>-10,533</td>
<td>9,703</td>
<td>-2,597</td>
<td>-1,666</td>
<td>-1,588</td>
<td>-1,521</td>
<td>-1,498</td>
<td>-1,439</td>
<td>-1,387</td>
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<td>Armed interest</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>VAT on operating business</td>
<td>0</td>
<td>1,598</td>
<td>16,008</td>
<td>26,595</td>
<td>28,294</td>
<td>28,932</td>
<td>29,796</td>
<td>30,627</td>
<td>31,413</td>
<td>32,141</td>
<td>32,766</td>
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<tr>
<td>Dividends</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Cash</strong></td>
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<td>OK</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
</tr>
<tr>
<td><strong>Cash flow from investments</strong></td>
<td>-3,628,168</td>
<td>-1,301,245</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>Capital expenses</td>
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<td>-1,301,245</td>
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<td>0</td>
<td>0</td>
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<tr>
<td>Recurrent capital expenses</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Interest accrued for funds in accounts</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Financial cash flow</strong></td>
<td>3,714,742</td>
<td>1,396,795</td>
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<td>-543,746</td>
<td>-543,742</td>
<td>-543,737</td>
<td>-543,737</td>
<td>-543,737</td>
<td>-543,737</td>
<td>-314,870</td>
<td>5,520</td>
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<tr>
<td>Loan drawing</td>
<td>2,971,794</td>
<td>1,040,596</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Interest repayment</td>
<td>0</td>
<td>0</td>
<td>-91,414</td>
<td>-32,212</td>
<td>-27,014</td>
<td>-21,763</td>
<td>-16,459</td>
<td>-11,102</td>
<td>-5,692</td>
<td>-800</td>
<td>0</td>
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<tr>
<td>Loan repayment</td>
<td>0</td>
<td>0</td>
<td>-511,911</td>
<td>-517,034</td>
<td>-522,248</td>
<td>-527,494</td>
<td>-532,794</td>
<td>-538,146</td>
<td>-543,352</td>
<td>-319,590</td>
<td>0</td>
</tr>
<tr>
<td>Mobilization of own funds</td>
<td>742,948</td>
<td>260,249</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Using of subsidies</td>
<td>0</td>
<td>95,550</td>
<td>434,286</td>
<td>5,520</td>
<td>5,520</td>
<td>5,520</td>
<td>5,520</td>
<td>5,520</td>
<td>5,520</td>
<td>5,520</td>
<td>5,520</td>
</tr>
<tr>
<td>Payment of Dividends</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Net cash flow for the period</strong></td>
<td>17,787</td>
<td>249,026</td>
<td>207,288</td>
<td>44,974</td>
<td>9,548</td>
<td>4,771</td>
<td>18,773</td>
<td>32,491</td>
<td>45,522</td>
<td>287,998</td>
<td>619,537</td>
</tr>
<tr>
<td>Funds (start of the period)</td>
<td>0</td>
<td>17,787</td>
<td>266,814</td>
<td>474,101</td>
<td>430,027</td>
<td>420,479</td>
<td>425,250</td>
<td>444,023</td>
<td>476,514</td>
<td>522,036</td>
<td>809,134</td>
</tr>
<tr>
<td>Funds (end of the period)</td>
<td>17,787</td>
<td>266,814</td>
<td>474,101</td>
<td>430,027</td>
<td>420,479</td>
<td>425,250</td>
<td>444,023</td>
<td>476,514</td>
<td>522,036</td>
<td>809,134</td>
<td>1,428,671</td>
</tr>
</tbody>
</table>

## BALANCE SHEET
### Business Plan for construction of a livestock (milk) facility in the Voronezh Region

**ASSETS**

<table>
<thead>
<tr>
<th>Non-current assets</th>
<th>Current assets</th>
<th><strong>Total</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Intangible assets</td>
<td>3,714,742</td>
<td>3,628,366</td>
</tr>
<tr>
<td>Research and development results</td>
<td>4,110,283</td>
<td>2,971,794</td>
</tr>
<tr>
<td>Fixed assets</td>
<td>3,163,995</td>
<td>3,220,860</td>
</tr>
<tr>
<td>Construction in progress</td>
<td>4,110,283</td>
<td>3,220,860</td>
</tr>
<tr>
<td>Income yielding investments into tangible assets</td>
<td>4,110,283</td>
<td>3,220,860</td>
</tr>
<tr>
<td>Financial investments</td>
<td>4,110,283</td>
<td>3,220,860</td>
</tr>
<tr>
<td>Deferred tax assets</td>
<td>4,110,283</td>
<td>3,220,860</td>
</tr>
<tr>
<td>Other non-current assets</td>
<td>4,110,283</td>
<td>3,220,860</td>
</tr>
</tbody>
</table>

**LIABILITIES**

<table>
<thead>
<tr>
<th><strong>Current assets</strong></th>
<th><strong>Total</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stocks</td>
<td>68,787</td>
</tr>
<tr>
<td>VAT</td>
<td>464,173</td>
</tr>
<tr>
<td>Receivables</td>
<td>0</td>
</tr>
<tr>
<td>Financial investments</td>
<td>0</td>
</tr>
<tr>
<td>Monetary assets</td>
<td>17,787</td>
</tr>
<tr>
<td>Other current assets</td>
<td>0</td>
</tr>
</tbody>
</table>

**EQUITY**

| Authorized capital | 742,948   |
| Own shares repurchased from shareholders | 1,003,197 |
| Revaluation of non-current assets | 0         |
| Additional capital (without reassessment) | 0         |
| Capital reserves | 0         |
| Unappropriated profits/(loss) | -320,276 |
| Long-term obligations | -2,971,794 |
| Borrowed funds     | -2,971,794 |
| Deferred tax liabilities | 0 |
| Provisions         | 0         |
| Other liabilities  | 0         |
| Short-term obligations | 3,192,226 |
| Borrowed funds     | 3,192,226 |
| Accounts payable   | 0         |
| Deferred income    | 0         |
| Provisions         | 0         |
| Other liabilities  | 0         |

---

### Borrowed funds

- **As of Year 1:**
  - **Amount:** 3,192,226
  - **Use:** Construction of livestock (milk) facility

- **As of Year 2:**
  - **Amount:** 3,192,226
  - **Use:** Further construction activities and infrastructure

- **As of Year 3:**
  - **Amount:** 3,192,226
  - **Use:** Completion of the facility and preparation for operations

---

### Summary

- The business plan is focused on constructing a livestock (milk) facility in the Voronezh Region, with a total investment of 3,192,226.
- The project includes the construction of infrastructure and is aimed at increasing milk production.
- The plan outlines a phased approach to funding, with borrowed funds covering the majority of the investment needs.
- The project is expected to be completed by Year 3, with ongoing focus on operational readiness.

---

**Note:** The financial data and projections are illustrative and subject to approval and may vary based on actual market conditions and project execution.
10.4. Project performance indicators. Payback and budget efficiency

Net present value (NPV) is calculated as the sum of the free cash flow of the project (FCFF) discounted by the weighted average cost of the invested capital (WACC) during the forecast period plus the final project cost determined on the basis of free cash flow for the last forecast period, assuming that the cash flow will grow by an infinite period of time with a growth rate corresponding to the long-term CPI level. The Project should be characterized by a positive NPV to ensure the profitability for the participants.

Internal rate of return (IRR) IRR is the interest rate for a zero NPV. IRR is the minimum acceptable rate because it is compared with the required rate of return - if the first is less than the second, the project is not attractive.

Payback period (PB). PB is the time necessary for the total cash receivables from the project to exceed the amount of investment (negative cash flows).

Discounted payback period (DPB). DPB is calculated the same way as a simple payback period, but accounting for the discounted cash flows (i.e., for the present time).

The weighted average cost of capital (WACC) was used as the discount rate.

<table>
<thead>
<tr>
<th>Key results</th>
<th>Measurement unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial efficiency</td>
<td></td>
</tr>
<tr>
<td>Project NPV (forecast period)</td>
<td>mn</td>
</tr>
<tr>
<td>IRR (forecast period)</td>
<td>%</td>
</tr>
<tr>
<td>Payback period (simple)</td>
<td>years</td>
</tr>
<tr>
<td>Payback period (discounted)</td>
<td>years</td>
</tr>
<tr>
<td>Discount rate</td>
<td></td>
</tr>
</tbody>
</table>

11. Analysis of the project risks

When establishing a plant, a number of risks arise, both common, typical for most investment projects, and special ones, related to the specifics of the activity of mini-metallurgical production.

Risks specific for the market, industry, country, politics, macroeconomics and other systemic risks were stipulated in the financial model of the Project. These risks are taken as accounted for for the purposes of this report and will not be further analyzed in this section: country specific and systemic risks of the Company activities, for example, are partially taken into account when calculating the discount rate and the cost of capital through the country risk premium and beta.

In order to analyze the risks that could potentially affect the implementation of the Project, there were used methods of sensitivity assessment and qualitative risk analysis.

The key risks of the project are as follows:
- Lack of project financing.
- Untimely delivery of animal feed in case of drought, plant diseases, harvest failure;
- Lack of raw milk in the market;
- Diseases, a decrease in the survival rate of young animals, increased culling, a decrease in productivity (or a low increase in milk yield) and, as a result, a failure to achieve planned targets of the production of due to a reduction in the number of livestock;
- Failure to achieve the milk quality necessary to sell it at the optimal prices (the risk is minimized by the fact that the proper milk quality has already been achieved at the existing facility).
- Increased competition, lower selling prices, increased commercial costs;
- Anticipating growth in costs, for example, feed prices (the risk is minimized by a significant independence of fodder provision).

- General economic instability;

- Change in state regulation - reduction of subsidies.

The following groups of risks are anticipated:

- risks of feasibility study and design;
- construction risks;
- risks associated with operating activities and their continuity
- market risks (demand risks);
- risks of financial activity.
- process risks;
- other project specific risks.
### Risks of feasibility study and design

<table>
<thead>
<tr>
<th>Risk</th>
<th>Risk factor</th>
<th>Possibilities to reduce the risk</th>
<th>Hazard rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes in requirements of regulatory organizations</td>
<td>Regulators can change requirements, which may require changes in the project documentation (business plan, construction design, etc.), which will entail additional costs</td>
<td>no</td>
<td>Low</td>
</tr>
<tr>
<td>Project changes by shareholders</td>
<td>Changes of some components of the project</td>
<td>Detailed consideration of the project at early implementation stages</td>
<td>Low</td>
</tr>
<tr>
<td>Incorrect estimation of time required for construction</td>
<td>The time required for construction differs from the time stipulated in the project</td>
<td>Engagement of technical experts</td>
<td>Low</td>
</tr>
<tr>
<td>Responsibility for ensuring the security of construction</td>
<td>Theft or damage to equipment and materials can lead to unforeseen expenses for the replacement of lost or damaged equipment and to delays</td>
<td>Ensuring the security of construction sites by a professional security service</td>
<td>Low</td>
</tr>
<tr>
<td>Responsibility for the safety of construction</td>
<td>Safety requirements must be strictly observed</td>
<td>Appointment of the person(s) responsible for compliance with the safety requirements</td>
<td>Low</td>
</tr>
<tr>
<td>Third-party claims</td>
<td>Costs related to third-party claims for compensation of damage from construction or property infringements</td>
<td>Reconciliation with the existing register of landowners, Agreement on necessary permits</td>
<td>Low</td>
</tr>
<tr>
<td>Changes in the requirements of legislation and regulatory bodies</td>
<td>Changes in legislation and regulatory requirements that will require changes to the project at the construction stage and, as a consequence, changes in costs</td>
<td>Survey work</td>
<td>Low</td>
</tr>
<tr>
<td>Changes in taxation</td>
<td>Changes in the taxation structure may affect the cost of the project</td>
<td>no</td>
<td>Low</td>
</tr>
<tr>
<td>Change of the VAT rate</td>
<td>A change of the VAT rate may change the project expenses.</td>
<td>no</td>
<td>Low</td>
</tr>
<tr>
<td>Other VAT changes</td>
<td>Changes related not to the VAT rate, but to the accrual procedure</td>
<td>no</td>
<td>Low</td>
</tr>
<tr>
<td>Contractor's refusal</td>
<td>In the event of the contractor's refusal to perform the contract, the search for a replacement will entail additional costs and delays</td>
<td>Stipulation of insurance measures in the contract with the contractor</td>
<td>Low</td>
</tr>
<tr>
<td>Inexperienced project team and project management personnel</td>
<td>Inadequate project management will lead to additional costs. For example, uncoordinated actions of contractors may result in delays of the construction schedule</td>
<td>Engagement of specialized organizations, Engagement of specialists with the necessary experience to the project team</td>
<td>Low</td>
</tr>
<tr>
<td>Strike of contractors</td>
<td>Strikes can lead to delays in the construction and manufacturing of equipment, as well as to additional costs for the project management</td>
<td>no</td>
<td>Low</td>
</tr>
<tr>
<td>Public protests</td>
<td>Public protests against construction for various reasons can lead to additional costs.</td>
<td>Implementation of the public campaign to explain the safety of the project and attract public support</td>
<td>Low</td>
</tr>
<tr>
<td>Incorrect estimation of costs and time required for commissioning of facilities</td>
<td>The cost of commissioning of individual buildings and the entire project can be estimated incorrectly, and delays may occur leading to additional costs.</td>
<td>Engagement of specialized organizations (consultants) to analyze the costs and time needed for commissioning of facilities</td>
<td>Low</td>
</tr>
<tr>
<td>Non-compliance with the design documentation during construction</td>
<td>Failure to perform the construction in accordance with requirements may lead to additional costs for redesign and construction</td>
<td>Monitoring at all stages of construction, Careful choice of contractors for construction</td>
<td>Low</td>
</tr>
<tr>
<td>Wrong estimate of the time required to install the purchased equipment</td>
<td>The time required for the installation is different from the anticipated time.</td>
<td>Engagement of technical experts at the stage of development and elaboration of the capital investments program</td>
<td>Low</td>
</tr>
<tr>
<td>Risk</td>
<td>Risk factor</td>
<td>Possibilities to reduce the risk</td>
<td>Hazard rate</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>---------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Unforeseen parameters of the production site</td>
<td>Unforeseen difficulties associated with the features of the selected location of the facilities, revaluation of the site capacity, underestimation of the required electric power</td>
<td>A preliminary site evaluation&lt;br&gt;Preparatory works and calculations (taking into account high cost of additional electric capacities)</td>
<td>Low</td>
</tr>
<tr>
<td>Hidden defects in buildings and facilities</td>
<td>Hidden structural defects in buildings and facilities may require major repairs</td>
<td>Regular inspections</td>
<td>Low</td>
</tr>
<tr>
<td>Loss of or damage to equipment during transportation</td>
<td>Damage or loss of equipment will lead to unforeseen additional costs and delays in planned deadlines</td>
<td>Ensuring the security of facilities&lt;br&gt;Conclusion of contracts with suppliers on secure terms, for example, DDP (Delivered, DutyPaid)</td>
<td>Low</td>
</tr>
<tr>
<td>Increase in accounts receivable</td>
<td>There is a risk of non-receipt of payment for delivered products by clients</td>
<td>Selection of clients and analysis of their solvency (use of specialized databases)&lt;br&gt;Use of prepayment and provision of appropriate sanctions for delay in contract repayments</td>
<td>Medium</td>
</tr>
<tr>
<td>Dependence on major suppliers; their unscrupulous activity</td>
<td>Dependence on a supplier of the main raw materials (steel scrap), if it fails to meet its obligations or deteriorates the quality of the supplied raw materials, will lead to an increase in production costs, a reduction in negotiation leverage, interrupted production, shortage of finished products, loss of contracts with buyers.</td>
<td>Analysis of the possibilities for cooperation with other aluminum producers (in other regions)&lt;br&gt;Careful selection of suppliers&lt;br&gt;Conclusion of long-term contracts&lt;br&gt;Having a person with relevant experience, responsible for interaction with suppliers</td>
<td>Medium</td>
</tr>
<tr>
<td>Dependence on main customers</td>
<td>A relatively small number of counterparties (mainly in the North-West region) leads to a high level of dependence on each of them and a reduction in negotiating leverage</td>
<td>Conclusion of long-term contracts&lt;br&gt;Preliminary thorough analysis of solvency</td>
<td>Medium</td>
</tr>
<tr>
<td>Interruptions in supply of power, heat, and water</td>
<td>Unforeseen changes in the costs of the supply of utilities can significantly affect the operating costs</td>
<td>Increasing independence from the supply of public services (it is planned to build its own substation)</td>
<td>Medium</td>
</tr>
<tr>
<td>Hidden defects in buildings and facilities</td>
<td>Hidden structural defects in buildings may require major repairs</td>
<td>Insurance of a respective risks of the contractor</td>
<td>Low</td>
</tr>
<tr>
<td>Activities of contractors and suppliers</td>
<td>Inefficient interaction with suppliers of raw materials and services can lead to poor coordination and a reduction in performance. This can increase the cost of production</td>
<td>Careful selection of suppliers&lt;br&gt;Conclusion of long-term contracts&lt;br&gt;Having a person with relevant experience, responsible for interaction with suppliers</td>
<td>Medium</td>
</tr>
<tr>
<td>Termination of the activities of the contractor or operator</td>
<td>- In the event of the contractor's refusal to carry out activities as part of the project, there is a need for production in the emergency mode.&lt;br&gt; - Additional expenses to find a replacement are possible.</td>
<td>Elaboration of a plan of measures to replace an absent contractor and formation of reserves&lt;br&gt;Creating a register of &quot;spare&quot; organizations</td>
<td>Medium</td>
</tr>
<tr>
<td>Strike of the personnel</td>
<td>Strikes of the personnel will lead to increased costs and inability to provide services</td>
<td>Elaboration of an effective HR policy&lt;br&gt;Monitoring the labor market to create a competitive and fair environment for the staff</td>
<td>Low</td>
</tr>
<tr>
<td>Loss of a major client</td>
<td>A down time of a significant part of the capacities designed for cooperation with a major client</td>
<td>The existence of arrangements with several smaller clients capable of occupying the available capacities</td>
<td>Medium</td>
</tr>
<tr>
<td>Incorrect estimation of the cost of services during the trial period in the market</td>
<td>Costs for rendering services may differ from those planned</td>
<td>Engagement of specialized organizations to assess the costs</td>
<td>Low</td>
</tr>
<tr>
<td>Change in the tax legislation</td>
<td>Changes in the taxation structure and rates may affect the cost of rendering the services</td>
<td>no</td>
<td>Low</td>
</tr>
<tr>
<td>An incorrect estimation of the cost of operation</td>
<td>The cost of operation of buildings and utility networks may be different from the forecast values</td>
<td>Engagement of specialized organizations to define the future costs</td>
<td>Medium</td>
</tr>
</tbody>
</table>
## Business Plan for construction of a livestock (milk) facility in the Voronezh Region

### Risk

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Possibilities to reduce the risk</th>
<th>Hazard rate</th>
</tr>
</thead>
</table>
| Incorrect assessment of the cost of power and heat supply | Engagement of specialized organizations to define the future costs  
Designing of equipment and buildings with taking into account energy efficiency | Low         |

### Market risks (demand risks)

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Possibilities to reduce the risk</th>
<th>Hazard rate</th>
</tr>
</thead>
</table>
| Reduced demand for iron ore                  | Regular analysis and monitoring of the market  
Conclusion of long-term contracts for grinding balls supply | High        |
| Reassessing the need for grinding balls in the North-West region and in the Russian Federation | A thorough analysis of the anticipated volume of demand for grinding balls  
Regular updating of forecasts based on newly obtained data  
Analysis of foreign sales markets, reorientation for export | Medium      |
| Lack of qualified personnel to increase production | Creation of a training program for proper qualifications and attracting specialists with the required experience (staff reserve, mentoring, the establishment of an educational center) | Medium      |

### Changes of the sanitary and epidemiological legislation towards stricter requirements for the production organization

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Possibilities to reduce the risk</th>
<th>Hazard rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Necessary number of qualified personnel is limited</td>
<td>Development of strict internal standards and regulations, cash flow planning with the consideration of the above</td>
<td>Low</td>
</tr>
</tbody>
</table>

### Changes of the fire safety legislation towards stricter requirements for the production organization

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Possibilities to reduce the risk</th>
<th>Hazard rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>The need to meet more stringent fire safety requirements: equipment, water supply, annunciation systems, stock of raw materials and products.</td>
<td>Development of strict internal standards and regulations, cash flow planning with the consideration of the above</td>
<td>Low</td>
</tr>
</tbody>
</table>

### Strike of the personnel

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Possibilities to reduce the risk</th>
<th>Hazard rate</th>
</tr>
</thead>
</table>
| Strike of personnel involved in production, for example, because of insufficient wages, will lead to increased costs and the impossibility to produce goods | Elaboration of an effective HR policy  
Monitoring the labor market to create a competitive and fair environment for the staff | Low         |

### Risks of financial activity

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Possibilities to reduce the risk</th>
<th>Hazard rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase of expenses</td>
<td>Extension of the list of scrap suppliers through direct contracts with local contractors, the introduction of a cost limitation system, the development of measures to reduce costs</td>
<td>Medium</td>
</tr>
<tr>
<td>Deteriorating liquidity indicators</td>
<td>The introduction of the financial control and budgeting system will allow more careful and prompt measures preventing deterioration of indicators; the creation of a reserve fund for future payments will also help reduce these risks</td>
<td>Medium</td>
</tr>
<tr>
<td>Deteriorated debt and financial sustainability indicators</td>
<td>Increase of equity by creating a reserve fund, reducing dividend payments before repaying debt obligations, as well as a continuous financial control also effectively reduce these risks</td>
<td>Low</td>
</tr>
</tbody>
</table>

### Process risks

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Possibilities to reduce the risk</th>
<th>Hazard rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>The availability of reliable supply of power, heat, etc. at a predetermined price</td>
<td>no</td>
<td>Low</td>
</tr>
</tbody>
</table>
### Business Plan for construction of a livestock (milk) facility in the Voronezh Region

<table>
<thead>
<tr>
<th>Risk</th>
<th>Risk factor</th>
<th>Possibilities to reduce the risk</th>
<th>Hazard rate</th>
</tr>
</thead>
</table>
| **Availability of construction materials and equipment required for the project** | - Impossibility to purchase the required materials and equipment due to the increase in cost will lead to a violated deadlines or changes in the project parameters  
- Impossibility to purchase some part of the equipment on time due to the supplier being abroad can lead to a violation of deadlines and increased cost | Most of the construction materials of buildings are standard and easily accessible  
The delivery of equipment has been precontracted and insurance measures have been taken against the delivery deadline | Low |
| **Changes of the sanitary and epidemiological legislation towards stricter requirements** | The need to ensure more stringent sanitary and epidemiological standards: special places for storing cargo, providing access to special services, delays in servicing goods, etc. | no | Low |

### Other project specific risks

<table>
<thead>
<tr>
<th>Risk</th>
<th>Risk factor</th>
<th>Possibilities to reduce the risk</th>
<th>Hazard rate</th>
</tr>
</thead>
</table>
| **Compliance with the requirements of local and international environment legislation** | The operational activities of the project can potentially lead to protests from environmentalists and the local community | The necessary capacities for a legal disposal of waste are planned  
There are standard procedures planned for control of environmental safety | Low |
| **Prolongation of the terms and/or increase in the cost of the project in connection with force majeure** | Additional costs and delays are possible when force majeure circumstances occur | Insurance of risks associated with force majeure circumstances (limited) | Low |
| **Termination of the project due to a force majeure** | Possibility of the project termination because the participants are unable to fulfill their obligations due to force majeure circumstances | no | Low |
Appendix 1. Project Team

CV
of the Head Veterinarian

ALEKSANDR KOSTYANOY

Date of birth: August 25, 1960
Citizenship: Russia

Education
1979
Ostrogozhsky Agriculture Training College Veterinary Assistant, specializing in Veterinary Medicine

Work experience
January 2016 - present
time
Khokholskaya Agricultural Company, LLC
Position: Head Veterinarian
Administrative and process control of the crops growing.
Organization of land reclamation, ensuring a rational use of the land fund, machine and tractor fleet, fuel and chemicals.
Organization of seed production activities, reproduction of regional specific, prospective and scarce seeds, accelerated change of seed variety and strain renovation,
 provision of development and implementation of measures for the scientific work organization, qualification and rational application of work places.

February 2010 - January 2016
OstrogozhskAgroCompleks LLC
Position: Head Veterinarian
Administrative and process control of the crops growing.
Organization of land reclamation, ensuring a rational use of the land fund, machine and tractor fleet, fuel and chemicals.
Organization of seed production activities, reproduction of regional specific, prospective and scarce seeds, accelerated change of seed variety and strain renovation,
 provision of development and implementation of measures for the scientific work organization, qualification and rational application of work places.

September 2002 - May 2005
State Institution Ostrogozhsk District Station for Animal Disease Control
Position: Veterinarian
Examination of animals, disease and damage diagnostics.
Research of the causes of occurrence, the processes of the course of animal diseases, sorting of methods of their treatment and prevention.
Therapeutic and surgical treatment of animals.
Veterinary measures to prevent diseases and death of animals.
Control over compliance with hygienic and veterinary regulations for keeping,
feeding animals and animal care during the inpatient treatment. Veterinary and sanitary examination of livestock.
CV

of the Chief Agronomist

SERGEY KOMAROV

Date of birth: September 01, 1974
Citizenship: Russia

Education

State University of Ukraine, Agronomy and Soil Science, Agricultural Scientist

Work experience

Khokholskaya Agricultural Company, LLC
Position: Chief Agronomist
Administrative and process control of the crop growing. Organization of keeping the history book of fields, the land book and other records, timely compilation of reports and submission to top level bodies. Participation in the organization of training, professional development and recertification of personnel. Control over the operation of sections, agricultural plots in the crop sector. Establishment of rational production and economic relations of the crop industry with servicing and processing enterprises (companies) of the agribusiness industry. Control of the crop industry workers meeting the production and industrial discipline, rules and regulations of labor protection, industrial sanitation and fire protection.

OstrogozhskAgroCompleks LLC
Position: Chief Agronomist
Administrative and process control of the crop growing. Organization of land reclamation, ensuring a rational use of the land fund, machine and tractor fleet, fuel and chemicals. Organization of seed production activities, reproduction of regional specific, prospective and scarce seeds, accelerated change of seed variety and strain renovation, provision of the enterprise with high-quality commercial seeds and its correct application. Participation in the development of long-term and annual plans for the development of the economy and self-supporting assignments to the divisions. Development of process maps, production programs and work plans for crop production. Control over quality and promptness agricultural activities, use of machinery, quality of manufactured products, labor and material costs in the industry, measures taken to prevent losses. Participation in the compilation of calculations and applications for the purchase of mineral fertilizers, machinery, equipment and other material equipment for crop production, in reviewing and selecting projects for the
construction of production facilities and facilities for the industry and in the activity of acceptance committees for the commissioning.
Provision of development and implementation of measures for the scientific work organization, qualification and optimization of work places.

April 2004 - November 2003

Ostrogozhsky Trade House Finist LLC
Position: warehouse keeper
Reception at the warehouse, weighing, storing and issuing various material values from the warehouse. Checking the consistency of the accepted values with accompanying documents. Transferring material values to storage locations. Management of loading, unloading of cargoes and their placement inside the warehouse.
Batching tangible assets on demand.
Provision of security of the stored commodity and material assets and compliance with storage modes.
Drawing up schedules of defects on faulty tools, instrumentation, etc., drawing up statements for their repair and write-off, as well as for shortage and damage of materials.
Provision of compliance with rules of registration and delivery of supporting vouchers, drawing up of the established reports. Participation in the inventory of commodity and material assets.
CV
of the production director

Sergey Mochalov

Date of birth: December 09, 1962
Citizenship: Russia
Phone: +7(920) 408-10-69
Email: mochalov_sv@bk.ru

Marital status: married, two children
Desired schedule: full time

Education

1985
K.D. Glinka’s Voronezh Agricultural Institute
Mechanization Department,
Specialty - Mechanical Engineer

Work experience

November 2015 - present
time
Khokholskaya Agricultural Company, LLC
Position: Executive director
- Organization of operation and effective interaction of production
  units and structural divisions.
- The organization, tracking and responsibility for the implementation of all orders of
  the director and his deputy.
- Prompt estimation of results of the company’s activity and drawbacks, and
  development of plans on their elimination.
- Responsible for the implementation of the company's policy and the
  implementation of measures to develop value orientations in the company's activities.
- Responsible for observance of labor discipline, fulfillment of orders and
  instructions.
- Material and technical support of the company.

April 2012 - September 2012
Formmaterialy LLC
Position: Head of Transportation department
- Organization of the operating schedule and delivery schedule of the enterprise's
  products;
- Analysis of the efficiency of the vehicles use;
- Control and analysis of vehicles via GPS;
- Training and certification of the employees of the division;
- Negotiation and conclusion of contracts for the supply of equipment with third-party
  organizations;
- Registration of vehicles in the State Automobile Inspection and State Technical
  Supervision.

February 2012 - April 2011
DorAvtoTech LLC
Position: mechanical engineer
- Organization of the operating schedule and delivery schedule of the enterprise's
  products;
- Organization and control of repair works of motor vehicles, provision of spare
  parts;
- Analysis of fuel and spare parts consumption;
- Registration of vehicles in the State Automobile Inspection and State Technical
  Supervision.
July 2005 - October 2011  
**VoronezhSelMash OJSC**  
**Position: Head of Transportation shop**  
- Organization of delivery of equipment and components for the production process;  
- Control over the motor transport repairs;  
- Preparation and performance of technical inspection;  
- Registration of vehicles with the State Automobile Inspection and State Technical Supervision;  
- Investigation of road accident causes and implementation of measures to eliminate them;  
- Control over the consumption of fuel, lubricants and spare parts;  
- Training and certification of the employees of the division;  
- Analysis of expenses in the division for the reporting period;  
- Analysis of time frames of effective operation of vehicles;  
- Negotiation and conclusion of contracts for repair and supply of equipment with third-party organizations;  
- Control of observance of labor discipline and safety precautions.

July 1987 - May 2005  
**SRE Voronezh Experimental Station VNIIK**  
**Position: Chief Engineer**  
- Organization of maintenance and control over repairs of machinery and equipment;  
- Organization and performance of field works;  
- Development of instructions and observance of safety precautions, investigation of accidents at work;  
- Qualification of workplaces and employees of subdivisions;  
- Economic analysis of the enterprise’s expenses;  
- Control of fuel, lubricants, power and gas consumption.  
- Analysis of the operation of machinery for the reporting period;  
- Write-off of fixed assets;  
- Negotiation and conclusion of contracts with third-party organizations.

**Professional knowledge and skills**  
- Successful experience in organizing the operation of an agricultural enterprise;  
- Confident PC user (MS Office: Word, Excel, Outlook, Internet)  
- Knowledge of regulatory documentation.
CV
of the Company Director

Vladislav Savin

Date of birth: March 16, 1969
Citizenship: Russia
Phone: +7(903) 651-43-01
Email: kostenki36@yandex.ru

Marital status: Married, one child

Education
1998
Voronezh State University
Faculty of Law
Specialty in Law

Work experience
October 2009 - present
Khokholskaya Agricultural Company, LLC
Position: Director
Management of the company in accordance with the current legislation for the production, economic and financial activities.

June 2007 - September 2004
SUE VO “Voronezhoblizing”
Position: Deputy Director
Management of the financial and economic activities of the company. Development and drawing up of future and current plans. Organization of accounting system for all financial transactions, preparation of accounting documentation. Negotiations on behalf of the company with contractors on economic and financial transactions, concluding contracts on behalf of the company, ensuring the fulfillment of contractual obligations.

September 2004 - April 2000
VEKS Voronezh Excavator OJSC
Position: CEO assistant
The organization of work and effective interaction of all structural divisions, the direction of their activities for the development and improvement of services, improving the company performance, increasing sales of equipment and increasing profits. Ensuring the company fulfills all obligations to the federal, regional and local budgets, suppliers and customers.
CV
of the Chief Livestock Expert

Evgeny Kukoba

Date of birth: August 10, 1962
Citizenship: Russia
Phone: +7(910) 732-26-13

Marital status: married, two children
 Desired schedule: full time

Education
1990
K.D. Glinka’s Voronezh Agricultural Institute
Specialty - Animal husbandry

2006
Russian Academy of the State Service under the President of the Russian Federation, Voronezh Branch
Specialty in Law

Work experience
November 2015 - present time
Khokholskaya Agricultural Company, LLC
Position: Chief Livestock Expert

- Implementation of administrative and process control of the livestock production.
- Development and implementation of zootechnic, administration and economic measures aimed at improving the use of animals and poultry, livestock buildings.
- Participation in the development of long-term and annual plans aimed to develop the economy and the tasks of the divisions, plans of the livestock movement, its reproduction and breeding of young animals.
- Creation of a solid fodder base, provision the livestock production with machinery and automation means, equipped facilities for livestock and poultry, repair materials, overalls, containers, etc.
- Organization of cattle accommodation at farms and premises, wintering housing, summer housing and grazing, acceptance of fodder crop production units, determination of their quality and quantity.
- Ensuring the conservation of the fodder, and its preparation for feeding.
- Control over the quantity and quality of products, comprehensive feeding and proper keeping of livestock and poultry, timely harvesting, storage and use of fodder; control over machinery, labor costs, materials and resources in the industry.
- The organization of breeding work aimed at improving the breed quality and productivity of livestock and poultry; participation in elaboration and performance of veterinary preventive and therapeudic activities.

March 2010 - October 2015
All-Russian Scientific Research Institute of Mixed Fodder Industry OJSC
Position: Chief specialist in animal husbandry
- Conducting scientific research in the field of animal husbandry.
- Research and implementation of advanced methods of breeding, raising livestock and poultry.
- Calculations of the required number of fodder for animal care and their submission for approval to the management.
- Selection of animals for breeding, selection and pairing.
- Determination of the animal housing mode (temperature, humidity, air exchange, etc.) and monitoring the compliance with it.
- Control and coordination of breeding, growing and caring for animals.
- Organization of artificial feeding of young animals and care for them.
- Development of measures for animal sanitation, washing and cleaning.
- Organization of the accounting of animal productivity.

November 2008 — March 2010
Voronezh Quail Farm OJSC
Position: Deputy Director
- Process organization;
- Human capital management;
- Procurement of consumables;
- Preparation of accounting documents.

December 2006 — November 2008
Agroteknologii LLC
Position: Deputy Director
- Management of the company as a deputy director;
- Management of production sections;
- Human capital management;
- Concluding contracts for harvesting services;
- Management of the engineering team for the maintenance of combines and tractors;
- Signing statements of completed works and reconciliation acts;
- Organization of procurement and supply of spare parts;
- Preparation of accounting documents.
- Control over the security of enterprise resources.

August 1998 - December 2006
Main Department of Agriculture and Food of the Voronezh Region
Position: Chief Specialist of the Poultry Division of the Committee for the Development of Livestock Industries, 3rd Class Public Service Counselor of the Region
- elaborating drafts of state decisions on prospective, strategic problems of livestock development;
- taking part in the preparation of proposals for determining the regional policy for the assigned activities of the relevant subdivision;
- participation in drafting regional laws and other regulatory legal acts, regional programs;
- participation in the organization, regulation and supervision of the implementation of the adopted regional laws, other regulatory legal acts, regional programs;
- analysis and forecasting of social and economic development of the region's economy, in particular the implementation of innovations to the livestock sector;
- preparation of draft answers to the requests of government agencies of the Russian Federation and the Voronezh region, municipalities, as well as institutions, organizations and citizens;
- analysis of the state and development trends in the supervised industry, its scientific and technical potential on the basis of collected and processed data of subordinate enterprises, institutions and organizations;
- application of relevant foreign experience; practice of legal regulation of relations in the supervised sector; drafting proposals for the improvement of the current legislation.

Professional knowledge and skills
Successful experience in organizing the operation of an agricultural enterprise;
• Confident PC user (MS Office: Word, Excel, Outlook, Internet)
Knowledge of regulatory documentation.

Miscellaneous
Efficiency, systematic thinking
High speed of work
Responsibility for the result
Analytical mind;
Communication skills;
Stress management.
CV
of the Finance Director

Lilia Kuzmicheva
Female, aged 42, born on August 24, 1974

Preferred communication +7 (908) 137-81-79
kuzmicheval@list.ru

Residence: Voronezh
Citizenship: Russia, has a permit to work in: Russia

Work experience - 19 years

August 2016 - present time

Khokholskaya Agricultural Company, LLC
Chief Accountant
Complete accounting and tax accounting (in the sphere of agriculture). Preparation and submission of all accounting and tax reports.
Control of financial and economic activities of the enterprise. Work with the tax authority: office audits, counter checks, reconciliation of balances.

April 2012 - August 2016
4 years 4 months

Standart-Kontinent LLC
Chief Accountant
Management of the accounting department of 4 people. Control over the accounting department operation, preparation of accounting and tax reporting. Types of business activity - common construction works for the erection of buildings (the contractor). The total number of employees in the company was 92 people. The company constructed a military community for the Ministry of Defense located at 74 Gramshi Str. Looking for a job due to a change of leadership in the parent company in Moscow and the termination of funding.

October 2010 - April 2012
1 year 7 months

SKiF LLC
Chief Accountant
Control over the accounting department operation (1 person in subordination); control over the implementation of internal regulations; compilation of annual and quarterly reports of two legal entities. Types of business activities: manufacturing and installation of ventilated facades and stained-glass windows. Invited to work by transfer to Standard-Continent LLC

February 2010 -

Roslider Group of Companies
Chief Accountant
Control over the accounting department operation (5 people in subordination); control over the implementation of internal regulations; coordination of the accounting department and other units in the group of companies; compilation of annual and quarterly reports of three legal entities. Type of business activities: taxi services, car lease services; internet shops activity.

Nordoutsourcing LLC
Expert accountant
Accounting and tax accounting (outsourcing) of a major client - "Family Doctor" OJSC (Moscow). Type of business activities: rendering medical services to the public. The head of 2 people in Voronezh and 1 person in Moscow. Experience in the development of internal company instructions, regulations.
1S 8.0 (Enterprise management), Provisions for accounting 18

Audit Company Garant Capital LLC
Chief accountant, consultant on taxation
- a consultant on taxation in the consulting department (primary job). Oral and written advising of legal entities and individuals on taxation and accounting issues within the general audit framework (except for insurance and banking activities), establishment of accounting and tax accounting at enterprises with various taxation systems and spheres of activity. The main customers are Liski-Sugar LLC, MUE Voronezhpassazhirtrans, OFS Svyazstroy-1 OJSC, MUE Bogucharkommunservice, MUE Pridacha Market
- the chief accountant (double duty in a subsidiary company), construction and installation work (general contract, contract work)

Accounting company Pallada LLC
Finance and accounting specialist
Rendering accounting services (outsourcing), restoration of accounting, the establishment of accounting and tax accounting (enterprises of various taxation systems and spheres of activity).
Accounting and tax accounting of the client SHARM LLC (a subsidiary of Parfum-Finist LLC) - wholesale trade in perfumes and cosmetics. 1 person in submission

Installation and Construction Company Contact LLC
Chief Accountant
Management of the accounting department of 3 people Control over the accounting department operation, preparation of accounting and tax reporting. Types of business activities - construction and installation works, carpentry shop, sawmill, mortar unit, metalwork shop, car fleet for 10 cars, wholesale trade, about 60 employees.

Elektrontechstroy CJSC
Deputy chief accountant
Management of the accounting department of 5 people. Control over the accounting department operation, preparation of accounting and tax reporting; about 100 employees in the company. Types of business activities: construction (contractor, general contractor).
### Education

<table>
<thead>
<tr>
<th>Year</th>
<th>Institution</th>
<th>Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>Voronezh State Technical University</td>
<td>engineer economist</td>
</tr>
<tr>
<td>1993</td>
<td>Voronezh power industry professional college</td>
<td>accountant</td>
</tr>
</tbody>
</table>

### Advance training

<table>
<thead>
<tr>
<th>Year</th>
<th>Program</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>Audit</td>
<td>Financial academy under the Government of Moscow, auditor’s diploma</td>
</tr>
<tr>
<td>2000</td>
<td>Accounting</td>
<td>Voronezh branch of MIMMF, a diploma of a professional accountant</td>
</tr>
</tbody>
</table>

### Key skills

**Language knowledge**
- Russian — native
- English — basic knowledge

### Additional info

**About me**
- 18 years of experience in the sphere of accounting and finance;
- experience in keeping records for several legal entities, including as a part of a holding, the presence of separate subdivisions;
- knowledge of accounting and taxation in the enterprises engaged in trade, service rendering, production, construction, experience of the accounting restoration and establishing;
- Base knowledge of the economic activities analysis at enterprises;
- PC knowledge; accounting programs: 1S 7.7, 1S 8. "Consultant Plus" legal reference system, Client-Bank, office applications;
- positive experience of passing tax audits;
- a qualified, sociable and disciplined worker.
Appendix 2. Data references

The following data sources formed the basis of the review:

1. Data by the Project initiator:
   1.1. financial model of the Project;
   1.2. Data provided on request

2. Data of public sources:
   2.1. Macroeconomic assumptions;
   2.2. Market situation
   2.3. Other data

3. Legal and other prerequisites:
   3.1. Taxation data;
   3.2. Data on subsidies;
   3.3. Data on target State programs for support of agri-businesses at the federal and regional levels