Wheat is the most important food crop for humans, and the majority of the population of the Earth (70%) consumes products made from wheat flour. Food products prepared from it are tasty, nutritious, and well-digestible. Today, more than 80 countries of the world are engaged in the cultivation of wheat, and in terms of area and volume of production, this crop is in first place in world agriculture. The implemented programmatic measures for the modernization and diversification of agriculture ensured an increase in the volume of agricultural production by 6.6 percent.
Most of the wheat grown in Uzbekistan (90-95%) belongs to the 3rd class of high-value wheat. The weight of "strong wheat" is 15-20%, medium wheat 25-30%, and weak wheat 50-55% in the gross yield of soft wheat grown in the world. The task ahead of us should be to further increase the productivity of grain crops, as well as to effectively ensure the purity and high-quality cultivation and preparation processes. One such problem is harmful and poisonous weeds that spread in grain fields, and ecologically clean and effective methods of combating them should be further improved.

Rakhmatov Eldor Raykhonovich is Senior lecturer of the department of technology of food products of Karshi Institute of Engineering and Economics. He has been published more than 50 scientific papers in prestigious journals and international conference proceedings, all about chemistry and chemical engineering as well as several books.

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Eldor Rakhmatov

SCIENTIFIC BASIS OF THE INFLUENCE OF GRAIN INDICATORS ON FLOUR QUALITY

MONOGRAPH

LAP LAMBERT Academic Publishing

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Rakhmatov Eldor Raykhonovich

SCIENTIFIC BASIS OF THE INFLUENCE OF GRAIN INDICATORS ON FLOUR QUALITY

The scientific basis of the influence of physical and chemical indicators of grain on the quality of the flour. Monograph

The monograph shows the need to properly organize the processes of vitrification, nature, friction coefficient, heat transfer, unloading, and storage in determining the quality of grain by studying the physicochemical indicators of grain received from farmers and clysters.

In the process of grain storage, the improvement of physical and chemical parameters is primarily the cultivation of local varieties of wheat suitable for the soil and climate conditions, depending on agrotechnological measures, dry cleaning of grain, moderate treatment with water, and complete operation of equipment. information on grain control, increasing the quantity and quality of flour obtained from it, and reducing the consumption of additional materials in grain cleaning technology.

The monograph is based on the results of the scientific research work carried out, and compares the results of storage of unrefined grain and refined grain for several months before putting it into storage. consists of information about

The research was carried out at Koson DMQQ Limited Liability Company, and suggestions were made about the ways to achieve economic efficiency due to low losses in grain storage. The monograph prepared by the authors can be used by engineers and technicians, researchers, graduate students, and students working in the field of grain products.

Responsible editor:

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A.N. Akhmedov - doctor of technical sciences, professor, etc.
M. Mamedov-head of the mill workshop of the Kashkadarya grain products joint-stock company.

The monograph was discussed and recommended for publication at the meeting of the Council of the Karshi Institute of Engineering and Economics No. 11 dated 28.06.2022

Contents

Introduction

Wheat is the most important food crop for humans, and the majority of the population of the Earth (70%) consumes products made from wheat flour. Food products prepared from it are tasty, nutritious, and well-digestible. Today, more than 80 countries of the world are engaged in the cultivation of wheat, and in terms of area and volume of production, this crop is in first place in world agriculture. The implemented programmatic measures for the modernization and diversification of agriculture ensured an increase in the volume of agricultural production by 6.6 percent.

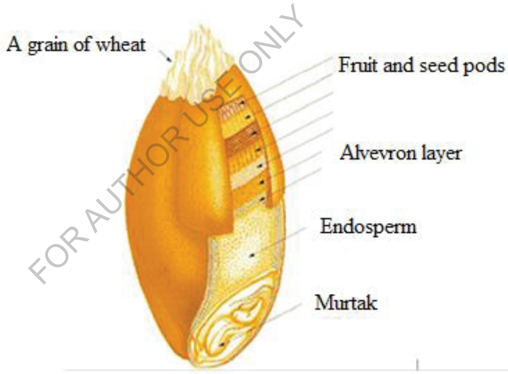
Most of the wheat grown in Uzbekistan (90-95%) belongs to the 3rd class of high-value wheat. The weight of "strong wheat" is 15-20%, medium wheat 25-30%, and weak wheat 50-55% in the gross yield of soft wheat grown in the world. The task ahead of us should be to further increase the productivity of grain crops, as well as to effectively ensure the purity and high-quality cultivation and preparation processes. One such problem is harmful and poisonous weeds that spread in grain fields, and ecologically clean and effective methods of combating them should be further improved. Meeting the population's need for grains and grain products is one of the most urgent tasks in today's market economy. Today, the annual threshing of grain grown in our country exceeds 6 million tons. It depends on the economic potential of each country and the lifestyle of the population, as the level of supply of grain, and grain products. Wheat bread is the greatest invention discovered by mankind. Therefore, any measure aimed at stabilizing the grain yield and quality of the total grain yield is of great importance.

Cereal crops occupy the first place among agricultural crops in terms of cultivated area. If the total area of agricultural crops in the world is one billion hectares, more than 70% of it is the area of grain cultivation.

CHAPTER I. DESCRIPTION OF GRAIN AS A RAW MATERIAL IN FLOUR PRODUCTION

1.1. The grain structure

The main raw materials for flour production are wheat and rye. Wheat and rye grains are very similar in structure and consist of three main parts: endosperm, membranes and seed (Figure 4.1). Endosperm - the inner part of the grain is a powdery core, in which the main nutrients are stored. Large endosperm cells are filled with starch grains, which contain protein substances. The endosperm contains a relatively small amount of minerals, fat and vitamins. Unlike the main part of the endosperm, the aleurone layer has high protein and mineral content [6,7,8].



Picture. 1. Long and cross pieces of wheat grain:

Two types of membranes adhere to the aleurone layer from the outside: outer - fruit and inner - seed coat. Each membrane consists of three rows of cells. Membranes contain a large amount of fiber and other substances that cannot be digested by the human body, as well as mineral substances.

Although the aleurone layer belongs to the endosperm, when the grain is ground into it, it is mostly separated with the husk, and in the analysis it is considered part of the membranes.Bug`doy va javdar donining urug`i mayda, u juda ko’p protein, yog`, vitamin va minerallarga boy.

The components of wheat and rye grains are listed in Table 1.1.

1.1. - table

Relative composition of grain components,%

Cereal parts	Grain type	
	Wheat	Rye
Endosperm	74,0-85,0	75,0-79,0
Shells:	4,2-6,3	4,8-5,5
Fruit	3,1-4,8	1,9-2,8
Seed	6,0-10,5	10,0-13,0
Aleurone layer	1,4-3,1	3,4-4,0

The state is divided into standard wheat types. The bases of this or that type are three characters:

- planting period (spring or autumn) - spring or autumn, respectively;

- botanical type - hard or soft;

- grain color - red grain or white grain.

Thus, grain is divided into six types:

I - soft spring red-grained;

II - hard spring;

III - soft spring white grain;

IV - soft autumn red grain;

V - soft autumn white-grain;

VI - hard autumn.

V and VI types of wheat are not of industrial importance, as they are produced in small quantities.

I, III and IV types of soft wheat are used in the production of baking flour, II types of wheat are used to produce pasta flour.

It is difficult to accurately assess the relative merits of different types of soft wheat, but in most cases it is type IV wheat that is best for flour production.

Installed and supplied wheat is divided into 6 classes depending on its quality: the highest, 1st, 2nd, 3rd, 4th and 5th classes. The classification is based on the amount, quality, vitreousness, nature, insoluble compounds and the content of germinated grains. The signs of these characteristics are considered below in the description of the technological characteristics of grain. The most valuable grain is wheat of the highest, 1st and 2nd grades [10,11,18].

Wheat flour is produced mainly for the production of bread products, less for pasta and confectionery products. When grinding wheat into high-quality flour, semolina is also obtained.

1.2. Physical properties of grain

To assess the quality of grain, its physical properties are important: shape, linear dimensions, uniformity, mass and nature of 1000 grains, specific gravity. Each of these signs, to one degree or another, determines the selection of appropriate technological methods, as well as grain preparation and grinding methods [6,7,8].

Shaped. Hard wheat has an elongated oval shape, soft wheat has a barrel-shaped shape. By shape and length, rye grains are divided into 4 groups: narrow long, narrow short, wide long and wide short.

Linear dimensions. These include the length, width and thickness of the grain. Table 1.2 shows the volume of wheat and rye grains.

1.2. - Schedule

Sizes of wheat and rye grains (mm)

Grain type	Thickness	Width	Length
Bug`doy	1,5-3,3	1,6-4,0	4,8-8,0
Javdar	1,2-3,5	1,4-3,6	5,0-10,0

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More flour is obtained when processing grain with a dark round shape than when processing grain with an elongated shape and edges.

Determining individual grain fractions in a batch by size is a necessary condition for choosing the size of sieve holes and holes in triremes.

Wheat grains are divided into the following fractions:

Passed through a large 2.8x20 sieve

Passed through a sieve with an average size of 2.8x20

It comes out of a sieve with holes of size 2.2x20

Passed through a 2.2x20 sieve

It comes out of a sieve with holes of size 1.7x20

The size of the holes in the sieve is given in millimeters.

Flatness characterizes the uniformity of grain mass. According to this indicator, grain properties are evaluated, they are determined in a set of sieves with round or elongated holes. The larger the mass of the large and medium fractions (3.0x20 mm and 2.5x20 mm passed through the sieve), the grains have a spherical shape compared to the small fractions, the less endosperm and membranes in it, and the greater the expected result flour productivity [13,17,28].

If the relative composition of grains of large and medium fractions in a batch of grain is 85%, then the grain is considered homogeneous or even in size. It belongs to the category of unripe grains that have been sieved with holes of 1.7x20 mm.

Flat grain is better cleaned of impurities, because it is possible to determine the appropriate size of the sieve holes for separating machines, the size and shape of the setae in trieters, the speed of the air flow in separator machines, and the working interval in grinding machines.

The uniformity of grain has a significant impact on the output and quality of milled wheat and rye products. Therefore, in flour mills, grain is sorted by size and the share of small grain is separated. Fine grain has very low millability, its presence significantly reduces the productivity and quality of flour. Therefore, it is selected through holes of 2.0x20 or 2.2x20 size and used for feed production [36,37,38].

The mass of 1000 grains serves as an additional indicator to linear dimensions describing grain size and uniformity.

These characteristics are very variable and depend on their variety, soil and climatic conditions, level of agricultural technology, harvest year, etc.

Nature. This is the mass of 1 liter of grain expressed in grams, the size, surface and moisture of the grain, its uniformity, nature and amount of impurities affect the amount of nature in the state of free compression.

Grains with rounded or flat surfaces are denser than those with elongated or rough surfaces. As the humidity increases, the nature of the grain decreases. If there are large organic impurities, the nature is reduced; in the presence of mineral substances - increases. The higher the shape and quality of the grain, the more grain it contains, the less the husk and the more endosperm, so the millability of the grain is higher.

1.3- Table

The mass of 1000 grains and the nature of wheat and rye grain are indicated (according to L. A. Trisvyatskyi).

Grain type	Mass of 1000 pieces, g	Grain type, g/l
Wheat	20-60	740-812
Rye	18-32	740-760

Grain specific gravity. It depends on the chemical composition and anatomical structure of grain and serves as a criterion for evaluating its quality. Specific weight of wheat grains is 1.33-1.48 g/cm3, rye - 1.26-1.42 g/cm^3 [40,41,48].

1.3. Donning kimyoviy tarkibi va ozuqaviy qiymati

Wheat grain contains proteins, carbohydrates, fats, pigments, vitamins, enzymes and various minerals. In Table 1.4. shows the chemical composition of wheat and rye grain.

Table 1.4

Chemical composition of wheat and rye grain

Name	tarkibi,%						
	proteins	starch	Total sugar	kletchatka	pentose	oil	ash
Wheat	10-18	61-70	2,2-2,6	2,4-3,1	7,1-7,7	2,1-2,5	1,6-2,0
Rye	7-12	60-66	5,6-5,8	1,7-1,8	8,0-8,3	1,7-1,9	1,9-2,2

Wheat proteins contain approximately 20% albumin and globulin, 80% prolamin, and glutelin, depending on the weight of all grain proteins. When water is added to it, a prolamin (gliadin) and gluten (gluten) form gluten [49,50,51].

As can be seen from the table, compared to wheat, rye grains have significantly fewer proteins and they do not form gluten.

When talking about the nutritional value of individual parts of wheat and rye grain, it is necessary to emphasize the very important role of proteins in human nutrition. Proteins contain amino acids necessary for the human body.

Shells, aleurone layer, and seeds contain the most minerals: potassium, magnesium, calcium, and phosphorus.

Wheat and rye contain vitamins Bi, B2, and PP [9,14,15].

The chemical composition of the wheat grain is very variable. Its content of protein, gluten, mineral substances, vitamins, pigments, and enzymes varies depending on the climate, soil, applied fertilizers, and applied agrotechnical, and varieties. According to the requirements of the world standard, it is written that the protein content of wheat grain should not be less than 13.5%. The amount of protein contained in wheat grain determines the purpose of its use.

14-15% protein is required in grain for baking bread, and 17-18% protein for making pasta products. The main source of vegetable protein for humans is wheat grain, which meets 50% of the protein requirement in the daily diet. The protein complex in the endosperm of grain consists mainly of gliadin and glutenin, and in the bran, it consists of albumin and globulins, the latter of which do not form gluten. Gliadin and glutenin form gluten [8,14,15].

The amount and quality of gluten, which affects the size, porosity, and spreadability of bread, is important in determining the bread-making properties of wheat flour. The high volume of the bread depends on the elasticity of the gluten and the ability of the dough to hold gas. Bread-making qualities of wheat depend not only on the amount of protein and gluten in the grain but also on the quality of gluten. If the elasticity of gluten is more than 30 cm and not less than 20 cm, or if the IDK-1 indicator is 45-75, then it is of good quality. The bread's spreadability is evaluated by the ratio of the bread's height to its diameter. Good quality bread will have a spreadability of 0.5 and above. It is required that the core is uniform, small porous, the surface has the same color, and has a unique smell and taste [8,14,15].

1.4. Structural and mechanical properties of grain

The structural and mechanical properties of grain are characterized by the condition of its components, as well as their level of resistance during grinding and preparation for grinding.

Durability depends on the grain's ability to withstand crushing during various impacts.

The strength of wheat and rye grain depends on the moisture content of the grain, its vitreousness and growth area. The larger the grain and vitreous, the more its brittle properties are manifested, the smaller and less vitreous, the better the plastic properties.

Microhardness. Different sections of the endosperm are characterized by different microhardness, depending on the variety, transparency, humidity, grain growing area, etc.

With increasing humidity, regardless of their structure, the level of microhardness of membranes and endosperm decreases [10,20,53].

Due to the fact that flour, bran and free-flowing mixtures are composed of crushed particles of different sizes and shapes, they have a high friction angle, so their flowability value is lower than that of grain. As the humidity of the products increases, their coefficient of flow decreases sharply.

Self-sorting refers to the layering of the grain mass in transportation, unloading, loading and grain storage warehouses by density and friction angle.

When grains are unloaded in warehouses and silos, heavy grains and heavy mixtures are closer to the center due to their high density, on the contrary, light grains and light mixtures move away from the center. Self-sorting creates favorable environments for the development of microorganisms and pests. This prompts the start of the self-heating process in the vertical position near the walls of the warehouse and silo, because it is in these places that small grains with high humidity and organic compounds fall [18,24,25].

1.5. Milling properties of grain

Grain grinding properties are determined in the process of processing grain into flour and are characterized by the following indicators:

The total output of flour and its quality; Productivity and quality of high-grade flour; The degree of polishing of shells; Energy consumption for the production of 1 ton of flour.

These indicators are directly related to the characteristics of grain - transparency, moisture, ash content, hardness, flatness, density, etc.

The properties of grain mainly depend on the content of endosperm, its content in wheat grain is from 74 to 85%, in rye from 75 to 79%.

The technological characteristics of grain during flour milling are usually evaluated by flour yield and ash content. The profitability and quality of the finished product depend on the characteristics of the anatomical structure of the grain, the relative composition of the endosperm (kernel), the shape and size of the grain, the organization of the technological process, and the characteristics of its fertility. The yield and quality of flour are directly affected by the humidity of the grain and the methods of its preparation and final processing (G. Egorov).

Ash content - the amount of ash formed in the process of burning grain or other products and calculated as a percentage of the dry matter of the product being burned. The amount of ash in the anatomical parts of the grain is not the same: the husks covered with the aleurone layer have the highest ash content, and the endosperm has the smallest. Soot components are an indirect indicator of the grain ratio, and are of great importance for controlling the degree of separation of the endosperm shell and evaluating the quality of the flour. The greater the amount of ash in the flour, the more crust it has, and the darker the flour, the lower its productivity [49,50,51].

Ashiness is an important indicator of grain grinding characteristics, as it characterizes the quality of final processing products. Grain ash is used as a relative indicator of its quality when calculating the output of flour. The ash content of grain depends on the characteristics of the variety and the soil and climatic conditions for growth. At the same time, it is necessary to take flour from grains with different ash content, with a flour content that is not higher than the norm. In recent years, the indicator of the quality of flour, such as flour, has been successfully replaced by the indicator of its whiteness, which was determined using special devices (Berkutova N.S., Shvetsova I.A., Butkovskiy E.A.).

Vitreousness is an important indicator of the technological properties of the grain, which determines the order of preparation of the grain for grinding, it is divided into vitreous grains, grains that weakly reflect light when illuminated, have a transparent appearance, small grains are opaque and transparent dark. , they are white. Grains are partially glass. The structural mechanical properties of the endosperm and the resistance of the grain to the damaging forces of the vitreous affect the intensity of flour grinding and the formation of intermediate products in terms of their quantity and quality. Cloves are easier to grind than parsley and produce more crops than cereals. Moisture is of great importance not only in grain storage but also in its processing. It is necessary to distinguish the natural moisture content of grain entering the enterprise. It is artificially created and stored with the so-called technological moisture lying with the grain and sent for processing.

Glassiness. The consistency of the endosperm or its transparency is determined by cutting the grain or using a diaphonoscope. Soft wheat is divided into three groups: above 60%, 40-60%, and below 40%.

As the transparency of the grain increases, the amount of large grain fractions increases. Therefore, transparency is one of the indicators that determine the milling properties of the grain.

Characterizing the structural and mechanical properties of the endosperm and the grain's resistance to destructive forces, it affects the intensity of milling and the formation of intermediate products (in terms of quantity and quality). The transparency of the grain also affects the specific energy consumption during its grinding.

As the transparency of soft wheat grains decreases, large grain fractions decrease, and small grains, flour productivity increases.

The ratio of coarse, medium, and fine coarse grains changes when obtaining a general product, mainly depending on the structural and mechanical properties of grain and its components, grain preparation, and grinding regimes.

As the transparency of the grain increases, the products are better glued and the endosperm particles are effectively separated from the husks. Good cooling of the grain and optimal modes of the mill will help this.

The composition of the endosperm. It is an important indicator of its productivity. Its quality description - ash content is of great importance. As the ash content of endosperm increases, the productivity of high-grade flour decreases.

Ash content in grain. This is the amount of ash (%) formed in relation to the dry amount formed during the burning of grain.

Ash contains oxides and potassium, phosphorus, sodium, calcium, magnesium, etc. Ash contains 30% phosphorus and 60% potassium. The amount of ash in the anatomical parts of the grain is not the same: the shells covered with the aleurone layer have the most ash, and the endosperm has the least (Table 1.5).

The amount of ash, which is an indirect indicator of the ratio of parts in the grain, is of great importance for controlling the degree of separation of the shells from the endosperm and evaluating the quality of the flour. The greater the ash content of the flour, the more crusts it contains, the less dense the flour, and the less productive it is.

Table 1.5

Ash content of grain and anatomical parts of soft wheat (% of absolute dry matter)

Ash	Grain	Endosperm	Aleyron caveat	Murtagh
Maximum	2,03	0,51	9,83	6,08
Average	1,95	0,46	8,49	5,98
Minimum	1,81	0,38	7,54	5,11

The ash content of the finished grain is always lower than the ash content of the sample because the latter has a higher relative content of husks. Thus, the ash content is an important indicator of grain milling properties, as it characterizes the quality of the final processed products. As a relative indicator of quality, grain ash content is used to calculate flour productivity. The amount of ash depends on the characteristics of the grain and the soil and climatic conditions of its growth. At the same time, it is necessary to take flour not higher than the specified amount from grains with different ash content.

Moisture is of great importance not only in grain storage but also in its processing. The natural humidity of the grain delivered to the enterprise, stored, and redirected for processing should be called the artificially created humidity of the grain.

In the process of wallpaper flour production, if the moisture content of the flour obtained from it does not exceed the standard value of 15.0%, then the grain of natural moisture is soil.

In the process of hydrothermal treatment, during the high-quality period, the grain is given optimal moisture, its value varies from 14.5 to 16.5%, depending on certain parameters of the grain, and determines the best results of its processing.

In the hydrothermal processing of wheat, water in shells with a developed capillary system plays the role of a plasticizer, which helps to increase plastic deformations and, accordingly, increase the strength and viscosity of the shells. Water penetration reduces the strength of the endosperm. When processing grain with high moisture content (15.5 - 16.5%), the quality of flour improves significantly, but the productivity of flour production decreases and energy consumption for flour production increases. With a moisture content above 18%, it is almost impossible to grind grain into flour. During the processing of dry grain with a density of less than 15%, its shell is easily deformed, and crushed, and enters it together with endosperm particles, which sharply deteriorates its quality.

Therefore, great attention is paid to the hydration of grain when grinding flour. The linear dimensions of the grain (length, width, thickness) give an idea of its size. Sizes of wheat grains - thickness from 1.5 to 3.3; width from 1.6 to 4.0; length 4.8 to 8.0 mm. (Egorov G.A.).

1.6. Baking properties of grain

The baking properties of grain come from the combination of biochemical and physical properties of flour, which in turn determines the quality of baked bread.

The baking properties of the wheat grain are evaluated by the amount and quality of raw gluten contained in flour, the gas-forming and gas-permeable properties of flour, as well as the flexibility, elongation, and spreading of gluten, as well as the deformation of the dough. In addition, a test baking is conducted to determine the size of the bread and the stability of the yield. Also, take into account the appearance, thickness, thickness, porosity, acidity, taste, and smell of the bread.

Quantity and quality of gluten. Gluten mainly consists of two protein fractions, alcohol-soluble, called gliadin, and alkali-soluble, called glutenin. It is the protein fraction that makes up 90%. A characteristic feature of these fractions is that they dissolve in water, but do not dissolve in it.

Gluten is washed from the dough, and starch, water-soluble and salt-soluble proteins, etc. are removed from it, leaving raw gluten containing 70% water. The amount of gluten in wheat grain is above 30%, from 26 to 30% - average, from 20 to 25% - above average, and below 20% - low. Gluten-forming proteins are mainly concentrated in the peripheral parts of the endosperm, therefore, high-grade flour contains less gluten than first-grade flour. The more protein in the grain (but not more than 17%), the higher the gluten content and the better the baking properties of the flour produced from it.

Various devices are used to wash gluten from grain and determine its quality: water dispenser, dough mixer, and mechanized gluten washer.

Its ability to form gas and retain gas. The ability to generate gas is the ability of the yeast to produce carbon dioxide during the fermentation of the dough under the influence of the yeast and the flour itself. The ability of flour to generate gas depends on the state of the carbohydrate-amylase complex, the presence of fermentation sugars in it, and the ability to generate them in the dough.

Table 1.6

Characterization of grain gluten quality in IDK device

Indicator of tools	Quality group	Gluten property
0-15	III	Weak
20-40	II	Satisfactorily stable
45-75	I	Good
80-100	II	Satisfyingly weak
105-120	III	Weak

The gas-holding capacity of flour is the ability to hold the gas produced during fermentation. This ability mainly depends on the amount and quality of gluten, and its flexibility is evaluated by the properties of elasticity (Table 1.6).

Gluten is divided into three groups:

- long or medium in good elasticity and elongation;
- with good elasticity and short elongation, as well as satisfactory elasticity and short, medium or long elongation;
- low elasticity, strong stretching, sinking under tension, tearing under its own

weight, floating, and not suitable for washing.

Denatured gluten produced from normal grains is light and dark from grains that have been germinated, damaged by self-heating, and damaged by frost or steam.

Soft wheat grains are divided into three groups according to their baking properties:

the first is a grain that is suitable both for independent use and as a booster for mixing because it gives its strong properties to wheat grain, which is a weak gluten;

the second - grain suitable for independent use only;

the third is a grain that needs to be added to improve cooking properties.

In flour mills, different types of grain are ground separately with the formation of flour varieties based on the grinding of various grain mixtures and mixing of various types of mixtures.

1.7. Forming a batch of grain grinding

In order to stabilize the work of the flour mill, increase the level of grain utilization, improve the quality of flour, and rationally use grain reserves, separate components are selected for the preparation of grinding batches in the elevator, from which grinding mixtures are subsequently prepared. They must ensure continuous operation of the plant for at least 10 days.

The need to prepare mill mixtures is explained by the fact that grain batches are of different types and come from different districts. Separate processing of each batch of wheat grain leads to the production of flour of different qualities, which, for example, does not allow the production of bread products that are stable in quality in bakeries. Therefore, the preparation of grinding batches is a technological method that ensures the stable operation of the enterprise and allows the production of products of the same quality. High and stable baking properties of flour produced at present are especially important.

It is necessary to prepare efficient and stable batches in terms of quality, to properly place grain batches in accordance with the storage requirements, and to prevent the mixing of different qualities of grain.

Proper placement and storage of grain in warehouses of grain processing enterprises should ensure an increase in the quantity and quality of grain received before processing. Grains with different technological characteristics should be stored separately: in particular, different types of wheat (I, III, and IV); wheat of different nature, for example, above 750 g/l, from 750 to 700 and below 700 g/l; different humidity, if it differs by more than 1.5%; Wheat differs in terms of the amount and quality of germinal grains, weeds, vitreous, gluten, especially high gluten content, and quality. Such wheat should be used in grinding mixtures as a violation of the baking properties of flour.

Mixing makes it possible to use grain with technological properties. After receiving the grain of the new harvest, it should be mixed with the grain of the previous year's harvest within the first 2 months.

The ratio of grinding batch components should be verified by test grinding in a laboratory mill. The following rules should be observed when creating a batch of grinding of technologically different components of wheat grain:

placement of grain according to certain signs;

- calculation of grinding batch recipes;

- formation of initial batches in elevators and warehouses with the simultaneous selection of fine grain fraction according to certain mill and cooking characteristics;

- separate preparation of grinder parts with different technological characteristics in the grain cleaning department;

- mix a large amount of pre-prepared grain before sending it to the grinding section.

The mixing process is carried out: with grain with different moisture content, if the difference in the initial batches does not increase according to this indicator.

0%; high ash grain with low ash; different cool grains to get an average of 60-60% transparency; grain with different gluten indicators to obtain flour that meets the standard for this indicator.

The best efficiency of the mixture is achieved by separate preparation of each batch of grain with different technological characteristics. For this, two or four streams of grain preparation are organized in large-capacity plants, and a technologically optimal mode is set for each stream. In enterprises with a small daily production volume, consistent preparation of different batches can be accepted. In this case, the cereal is mixed before grinding after weaning.

Moisture is of great importance when preparing grains for grinding. Long-term and reliable storage of grain in the elevator silo is ensured if the moisture content of the grain mass does not exceed 14.0-14.5%. But the most efficient cooling of the grain in the grain cleaning department is acceptable if it is moisture

5-12.0%. It is necessary to try to ensure that the moisture content of the grain mass of the different grains that make up the grinding batch does not differ by more than 1%.

The increase in the humidity range of different batches leads to an unstable flow of the cooling process. At the same time, it is impossible to ensure the uniform moisture content of the grain after setting the average mode of this process and conditioning. The unevenness of wetting also depends on the number of different grains in the grinding mixture. But if there is a large silage for settling for 20-24 hours, the moisture content of the grain mass in them will equalize.

In some cases, low-quality grain (germinated grain, damaged, etc.) is delivered to flour mills, where it is used for processing into flour (according to special instructions) or for the production of animal feed.

Sprouted grain. Grains germinate in excessive humidity and ambient temperature, as well as in unsatisfactory storage conditions. Sprouted grain increases the activity of enzymes, which negatively affects the grinding and baking properties of flour, as well as reduces the productivity of flour. During cleaning, severely deformed, perforated, sprinkled grains are partially removed. The amount of sprouted grain added to the mixture is determined based on laboratory grinding data.

The grain to be processed should not be more than 3% of the germinated grains.

Damaged grain. As a result of damage during the formation and ripening of the wheat grain, damaged wheat becomes dull, weak, and light. Studying the composition of spoiled grain, it includes saliva, which contains very active proteolytic enzymes that destroy gluten, and as a result, flour obtained from such grain has low cooking properties. Such grain is moistened in an amount of no more than 14.5%, which reduces the time of tearing.

Many damaged kernels are used for whole grains or for the production of animal feed.

The non-uniformity of the grain in terms of length, width and thickness prevents the same selection of effective separation, crushing, shelling, and hydrothermal treatment processes. In order to ensure high technological results, it is necessary to ensure that the groups of grains accepted for processing are aligned in terms of size.

To increase the uniformity of the grain groups, the loss of the small grain fraction and the sorting of the groups into several fractions are used.

Table 1.7.

Flour properties of grain of different sizes

Fractions of magnitude	Bakht		Sanzar - 8	
	Yield, %	Ash content, %	Yield, %	Ash content, %
1	76,3	0,61	76	0,63
2	72,4	0,60	74,8	0,61
3	72	0,59	73,1	0,60
4	69,2	0,68	68,2	0,65
5	67,8	0,70	66,5	0,67

If grains of different sizes do not fall in the shell separator, either the core of large grains is crushed or the shell of the small fraction remains intact.

The separation of grain into fractions is not used in flour weighing. However, the conducted studies show that if the flour weighing series is divided into two fractions as a result of sorting in 2a - 25 x 20 sieves, then the obtained residual and emulsified fractions are quite different in terms of properties and require separate soaking and refining.

It can be seen from the table that the total output of flour changed to 8.6% and 9.8%, and the ash content increased.

2a - 2.5 x 20 Calvin residue, the yield of graded flour was 63.8%, ash content was 0.89%, and the characteristic of 2a - 2.5 x 20 Calvin residue was 64.4% of flour was obtained from grains of the medium fraction, and the ash content was 0.95%, and the yield of flour from the small fraction was 61.9%, and ash content was 1.1%.

Therefore, it is recommended to separate the small grain fraction in the elevator in time and not to send it to flour weighing. Table 1.8 shows the direct effect of this method on flour weighing.

Table 1.8.

Efficiency of sorting of fine grain fraction

Flour factory (city)	Sorting percentage of the fine fraction	Increase in flour output		Decreased appetite	
		Total	High and first varieties	Total	High and first varieties
Karshi	11,6	1,45	1,12	0,02	0,02

It can be seen that even a small amount of fine-grain fraction separation has a positive effect.

The properties of grain are formed in the process of growing in the field and depend on the type, variety, soil, climatic conditions, and specific year's harvest. The properties of grain change after harvesting under the influence of external factors (moving, drying, etc.). All this leads to the fact that the types of grain arriving at grain processing enterprises are different in terms of all quality indicators [13,14].

The difference in grain properties requires correcting and optimizing the modes of the technological system.

For processing (after passing the preparation department) grain with a stable quality indicator should arrive. Stabilization of grain quality indicators at an unchanging level is considered to be the initial automation of the technological process. Stabilization of the technological properties of grain is achieved as a result of GTIB, as well as by mixing separate categories of different characteristics into a single flour milling mixture. The quality indicator of such a mixture may be given in advance. In this case, the task is performed by selecting the components of the mixture and calculating them in the required ratio [21,21,24].

In addition, the formation of flour weighing categories leads to the economical use of strong wheat grain, use in exact proportion with normal quality grain, and sometimes also effective use of weak wheat grain. Mixing grain before flour milling leads partly to the use of low-quality grains because when they are processed separately, it will not be possible to obtain graded flour that meets standard requirements.

Mixtures are made using eight quality indicators of grain: transparency, ash content, gluten content, volumetric weight, moisture, amount of contaminants and grain mixtures, and alignment according to size. These indicators are subject to the law of mixing and comprehensively describe the value of mixing the initial grain group, the last five indicators are taken into account when calculating the yield of flour from each grain group. In order to form efficient groups of grains for flour weighing in flour mills, it is necessary to implement the following measures: to ensure the separation of the initial grain groups in accordance with the specified requirements; to determine the size of the grain groups to be formed and create a mixture redactor; determine the procedure for creating intermediate grain mixtures; determination of the final formation procedure of grain groups for flour weighing [6,7,8].

When separating the initial categories, it is necessary to pay special attention to the quality indicators that describe its mixing value in terms of flour and non-bop properties. Such indicators include the type of grain, the region of cultivation, transparency, amount and quality of gluten, etc. It is necessary to keep grain groups that differ in terms of these indicators separately because as the initial component of the mixture, a specific selection of different groups is made. The volume of formed grain groups is enough to ensure 10 days of continuous work in the flour factory.

Formulation of a mixture recipe is one of the complex activities. It includes choosing the components of the mixture to be formed and their number, finding the ratio of components in the mixture, preliminary preparation of a grain mixture sample and crushing it in a laboratory mill, and final determination of the composition of the grain mixture to be formed.

When choosing the components of the formed mixture, all grain stocks stored in the enterprise are used in the same way.

Table 1.9.

Quality indicators of wheat grain

A sign of quality	Standards for wheat		
	Strong	Average	Weak
Protein content, % of dry matter	14	14-11	11
Transparency, % Type I and IV	75	75-40	40
Type III	60	–	60
Amount of dry gluten, % in grain	28	25	25
70% yield	32	30	30
Gluten quality (not inferior to the group)	I	II	II
Volume output of bread in 100 g	500	400-500	400

The following indicators are used to evaluate the strength of wheat: protein content, baking properties, transparency, amount of dry gluten, and quality of flour. The main indicator is the volumetric yield of bread. When experimenting with baking bread, the potential properties of flour are completely invisible (Table 1.9).

When mixing strong and weak wheat, its baking properties are improved. Mixing value means the ability to improve the quality of strong wheat grain with weak wheat grain. In this case, the quality indicators of the bread are brought up to the norm.

The threshold for improving the quality of bread can serve as an indicator of the improvement effect.

$$E = \frac{100(V_1 - V_2)}{V_2},$$

where: - volumetric yield of bread from the flour mixture;

- volumetric output of bread from weak wheat flour;

Figure 1.2 shows the graph of the volume output of bread depending on the content of the flour used for its preparation.

The amount of weak gluten flour is shown on the abscissa. It seems that the baking properties of flours made by mixing 50% weak and 50% strong wheat flours were higher than other options.

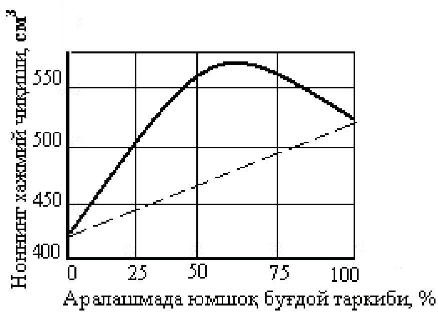

Figure 1.2. Dependence of volume output of bread on the ratio of strong and weak flour

But this ratio is not considered constant and the obtained components depend on strong and weak flour groups, finding the optimal ratio is an important technological task leading to the correct use of strong wheat.

In order to evaluate the technological properties of flour mixtures, it is advisable to weigh flour from grain in a laboratory mill MLU-202.

L. Ya. According to Auerman, A. I. Ostrovsky, and V. L. Kretovich, "mixture value" means the improvement of the quality of weak wheat under the influence of strong wheat. When the composition of grain is stable, the necessary mixture is prepared for the production of flour and the process of making bread from it for a long time (10-15 days). Improving the nutritional quality of bread is one of the main tasks facing scientists.

Technologists of the flour production industry always pay attention to the presence of protein-carbohydrate complex, amino acids, ash substances, fat and other substances in bread products. Table 1.10 shows the chemical composition of bread made from different types of flour.

Table 1.10

Chemical composition of bread made from wheat flour of different varieties

The type of flour	100 g of grain									
	in grams					in milligrams				
	Water	Protein	Hydrocarbate	klet-chatka	Ash	Ca	P	Mg	K	Fe
High grade	38	6,29	48,18	0,10	1,00	16	70	24	80	1,0
Type I	41	6,72	46,94	0,20	1,30	20	99	30	96	1,4
Type II	42	7,14	46,56	0,50	1,50	20	170	46	133	1,7

The numbers in the table show that type II protein is more abundant in it compared to others because this type of flour is made from the parts of the grain close to the fruit and seed shells. The amount of ash in it increases due to the addition of salt to the dough.

Before calculating the batch of grain mixture (pommel) to be weighed, the enterprise must determine the quality and composition of grains (gluten content, ash content, and vitreous content) in the elevator. After that, what kind of flour production is determined, and the calculation is started. As a rule, the mixture of grain to be pulled is prepared from two, three, or four components (of different varieties and quality). The basic calculations of grain mixtures to be weighed must meet the requirements based on the average quality indicators of grains. It is determined by the following formula:

$$MX = м_1 x_1 + м_2 x_2$$

where: M is the mass of the grain mixture to be weighed;

X is the required indicator of grain quality;

x1 — the quality of each component;

m1 is the amount of components in the grain mixture to be weighed.

Table 1.11

Calculation method of a batch of grain to be weighed consisting of a two-component mixture (%)

Indicators	Mixed components		Required mixture
	The first	The second	
Glassiness of grain	86	33	60
The difference of grain vitreousness from the required indicator	86-60-26	60-33-27	-
Components of the grain mixture calculation ratio	27	26	27-26-53

Three- and four-component mixtures are also determined by this formula. If 60 percent glassy wheat grain is drawn, it is required to make a batch of grain mixture from two components. the vitreousness of the first batch is 86%, and that of the second is 33%, and the mass of the weighed grain batch is 1000 t. when the calculation processes are carried out as given in the table below (table 1.11.).

When organizing the mixing of grain mixtures, it is necessary to ensure their homogeneity, and secondly, the preparation of individual "flour weighing" of each of the components should be carried out in an optimal order. Mixing of grains with each other is mainly done after GTIB processing is completed. This process is carried out with the help of measuring and mixing screws located at the bottom of the bunkers [8,21].

Separate preparation of components mainly depends on the characteristics of the mill shops.

CHAPTER II. METHODOLOGY AND MATERIALS OF SCIENTIFIC RESEARCH.

2.1. Methods of grain quality assessment.

Existing standard methods are used to perform the technical analysis of the researched wheat grains.

The obtained sample was analyzed based on the following standards: wheat moisture according to GOST 13586.5-85, wheat grain nature according to GOST 10840-64, the mass of 1000 grains according to GOST 10842-89, GOST 10987-76 wheat transparency according to GOST 10847-74, wheat ashiness according to GOST 23586.1-68, the quantity and quality of wheat gluten were determined.

Sampling and measuring separation are carried out according to GOST 13586.3 - 85. Analyzes are conducted on an average sample with a mass of not less than (2.0+0.1) kg. If the aggregated sample does not exceed (2.0+0.1) kg, then it itself will be an average sample. If it is more than (2.0 + 0.1) kg, the average sample is taken from it using the dividing or squaring method.

Using the method of squaring, the average sample is separated in the following order: the generalized sample is folded on a smooth surface, in the form of a thin square layer. After that, the grain layer is bent like a rib and leveled on one side using a flat wooden plank, and the grain sample is divided in the middle (diagonally) by holding both ends.

One of the pairs of opposite triangles is removed, and the other one is prepared for repeated division (this is continued until the mass of grains in the common triangle reaches 2.0 + 0.1 kg) [23].

Determining the geometric parameters of grain.

The choice of the scheme of separation of the grain mass from various mixtures, the choice of the separator, shell separator, cereal separator, as well as the working bodies of the grinding machines depends on the shape and linear dimensions of the grain. The size and outer surface of the grain are of great importance in the processes of moistening, heating and cooling of the grain.

The size of the grain is determined by the following formula:

$$V = 0{,}52 * a * b * l$$

where: a, b, l are grain width, thickness, length.

The following formula completely provides the area of the outer surface of the wheat grain.

$$F = -1{,}12a^2 + 3,\ 76\ b^2 + 0,\ 88\ l^2 - 10\ mm^2$$

It is convenient to evaluate the properties of the shape by grain sphericity, that is, the area of its outer surface is equivalent to the ratio of the volume of the sphere to the area of the grain:

$$\Psi = \frac{F_{ш}}{F};$$

Cleaning of grain from impurities.

The physical properties of grain and grain mass, along with their chemical composition and physiological properties, are of great importance in the proper organization of grain storage and processing. The principles of moving, cleaning, sorting and crushing of grain mass have been developed taking into account its physical properties.

The presence of foreign impurities in grain not only lowers its value, but also complicates storage and processing processes. In addition, the mixture may contain substances harmful to the human body.

Determining grain contamination is one of the important steps in its technical analysis.

The amount of grainy, extraneous, separately considered mixtures, as well as fine grain and grain size is determined according to the GOST 13586.2-81 standard. Work should begin with determining the amount of large pollutant compounds. The average sample is measured to the nearest tenth of a gram. Large pollutant compounds are separated from it in two ways: from large-seeded grains (corn, peas, nutritious legumes, beans, lentils, etc.) by hand, and from other grains by sieve.

Determination of grain moisture level.

Grain moisture refers to the amount of free or bound hygroscopic water in its content expressed as a percentage of the weight of the sample.

The amount of water in grain is the main indicator of its strength and one of the factors that determine its durability. Excess water in the grain accelerates the respiration process and allows the development of microorganisms and storage pests in the pile. Under the influence of low temperatures, the grain loses its germination as much as possible and becomes unsuitable for planting.

Excess moisture in grain (above 15.5-1.6%) is also known during processing. Such grain is poorly crushed, and the productivity of the mill decreases. There are 4 types of grain moisture, which determines the grain's storage resistance and the possibility of processing it from the standard side: 1) dry 2) semi-dry 3) wet 4) wet.

Wheat grain is defined by the following indicators: dry moisture up to 14%, medium dry up to 14-15.5%, wet up to 15.5-17%, and wet over 17%.

The methods of grain moisture determination can be divided into two groups: directly and by other methods. In the first group, the amount of water in the grain is determined by measuring its volume after squeezing out water in special equipment. Other methods for determining grain moisture are widespread [23].

Determining the nature of grain.

The nature of the grain is determined in PX-1 type one-liter or 20-liter sprays used for export grain categories. Natura is the weight of grain expressed in grams per 1 liter volume.

Before determining the nature of the grain in a liter sprayer, the middle sample is sifted through a sieve with a hole diameter of 6 mm and thoroughly mixed.

The larger the nature of the grain, that is, its volumetric mass, the higher the amount of useful substances in it. High natural grain is full and well developed. In it, the amount of endosperm is more compared to other grains, and the amount of the shell is less. All other conditions being equal, high-yielding flour is obtained from high-quality grain. That is why the nature of grain, cleaned of impurities, serves as one of the quality indicators of grain. The presence of admixtures sharply distorts the nature size and its relationship with flour quality indicators.

In most cases, an increase in humidity leads to a decrease in grain density and, therefore, a decrease in grain size.

In determining nature, the density of grain placement is important.

In a liter sprayer, regardless of the subjective influence of the operator, the density of grain placement is provided by a cylinder-filler, a cylinder with a funnel and a collapsing load.

Determining the nature of grain in a PX-1 one-liter sprayer

All parts of the purka are removed from the box and the lid is closed. The scale is moved to a carved coma on a tripod box. A hanger is put on the column bracket and the koromislo is placed in a coma, in which the prism is placed on the pillow. In order not to bend the tip of the indicator arrow and to ensure the safety of the prism, the koromislo is worn gently and carefully. It is installed on the operator with the digital side. Then rings are put on the prismatic ends of the koromislo.

On the right side of the Koromislo hangs a weighted measuring stick, and on the left side there is a platform for scale stones. The balancing of the load meter and the circuit is checked. If an unbalanced condition is observed, the spray is considered unusable.

After removing large impurities from the medium sample, measuring it to determine moisture content, and determining organoleptic indicators, damage, and metal magnetic impurities, it is thoroughly mixed and its nature is determined.

The load is removed from the meter. The meter is installed on a specially designed coma above the box. A knife is inserted into its slot (handle) with the digital side up. A collapsing load is placed on the blade. A filler is put on the gauge. Grain is fed into the cylinder with a funnel in a straight stream without shaking or pushing. The grain is placed in a special line inside the cylinder. If there is no special line inside the cylinder, in such a case, the grain is inserted until a distance of 1 cm remains from its upper edge. If the funnel is separable, the cylinder is closed with it and turned over, and the funnel is turned down and placed on the filler. After placing the cylinder with a

funnel on the filler, the stopper of the funnel is opened by gently pressing it with a finger. After the grain is poured into the filler, the funnel cylinder is removed.
The knife is quickly removed from the slot of the gauge (but without moving the tool). First the load, and then the grain falls into the meter. The blade is carefully inserted into the slot again, so that exactly 1 liter of grain appears in the measuring cup. Together with the filler, the meter is removed from the coma above the box. Turn them over and pour out the excess grain left in the filler. The filler is removed. Individual grains left on the blade are discarded. A knife is removed from the slot of the meter.
A grain-filled gauge is measured with an accuracy of 0.5 g and recorded in grain-quality documents (certificates and certificates) with an accuracy of 1 g.
For each grain sample, it is necessary to determine the nature of the grain at least twice. The difference between two parallel samples or arbitration analyses should not exceed 10 g for oats and 5 g for other crops.

The average arithmetic value of two or more determination results is accepted as a natural indicator. The results are rounded as follows: if a tenth of a gram is less than 5, it is discarded, if it is greater than 5, the number of grams is increased by one, and if it is equal to 5, the number of grams is rounded up. in the even integer part, it is discarded, and in the current integer part, it is increased by one unit [23].

Determination of the mass of 1000 grains.

The mass of 1000 grains determines its size and size. The larger the grain, the greater the mass of 1000 grains. Also, the mass of 1000 grains also evaluates grain stability. A large mass of 1,000 grains of equal size indicates that a large amount of nutrients has accumulated in this grain.

Grains and seeds with a mass of 1,000 grains have good technological properties, that is, a large number of finished products (flour, semolina) output. Because in such grains, the amount of endosperm (kernel) is large, and the part of the shell is high, which allows for an increase in the quality and quantity of the valuable product. All other things being equal, the mass of grain with high moisture content is also large. Therefore, the mass of 1000 grains is expressed in relation to the amount of dry matter. When preparing grain for analysis, two measurements are taken from the middle sample: one to determine grain moisture, and the other to determine the mass of 1000 grains. This site is for corn, beans, and nutritious legumes - 500 g, for peas, cowpeas - 200 g, for lentils and beans - 100 g, wheat, rye, barley, oats, and rice It is 50 g for small-seeded lentils and 25 g for millet. Measurements with a mass of up to 200 g are measured to the tenth of a gram, and measurements of more than 200 g are measured with an accuracy of 1 g.

Contaminant and live impurities are extracted from the measurements to determine the moisture content and the mass of 1000 grains. The first well-made gauge is used to measure humidity.

Two measurements are taken to determine the mass of 1000 grains. The analysis is carried out separately for each measurement. The measurement is thoroughly mixed and spread to form a square layer. A square is divided into four parts (triangles) along two diagonals.

For crops with large seeds, 125 seeds are counted without selection from each triangle (when the measurement is more than 100 g), and for other crops - 250 seeds. Grains and seeds from two opposite triangles are added. As a result, two measurements will be made: for crops with large seeds - 250 pieces each. A pair of oat grains separated from each other is counted as two grains. The four resulting weights are measured on a technical scale with an accuracy of one-hundredth of a gram. If the difference between the two measurements of large and small-seeded grains is not more than 5% compared to the average mass of the grain, the event is considered to have been carried out correctly; if the difference is large, then the analysis must be repeated from the beginning. . The mass of 1000 grains is found by summing two measured masses of 500 grains or by multiplying the sum of two measured masses of 250 grains by 2. The mass of 1000 grains in relation to the amount of dry matter is calculated according to the formula.

$$mk = \frac{mx(100 - w)}{100}$$

Here; mx is the mass of 1000 grains of real moisture, g; w - grain moisture (in %)

Determination of grain transparency.

A horn-shaped internal structure is characteristic of the transparent grain, and when the grain is cut, it looks shiny. The cut flour-like grain reminds the surface of a piece of chalk. The internal structure of the kernel (endosperm) is of great importance for wheat, rice, partially - barley, rye, and corn.

Wheat grain can be transparent - full transparent kernel, floury - full floury kernel, and partially transparent - partially floury or partially transparent kernel. During laboratory analysis, the general transparency of the grain is determined. Total transparency means the sum of half of fully transparent grains and half of partially transparent grains.

The transparency of the grain is of great importance in evaluating its flour and non-baking properties.

Two conditions are observed when preparing grain for analysis. In the complete analysis of the middle sample, the transparency of wheat grain is determined after the analysis of grain contamination. Only 50 g of the wheat grain is separated from the wheat grain for the analysis of transparency, and it is cleaned of foreign grain impurities.

According to the standard, transparency is determined in two ways:

a) using DSZ-3 diafanoscope

b) by cut grain.

Determination of transparency using the DSZ-3 diaphanoscope

The method of execution of the work is carried out in sequence. The cassette is removed from the device and cleaned wheat is put into it. By rotating the cassette, 100 cells along its horizontal surface are filled with one grain each. By slightly tilting the cassette, excess grains are dropped. It is checked that it is filled with grain. If there is no grain in any room, grain is thrown to them. If two grains fall into one cell, one of them is removed. The cassette is installed in the body of the device and the light is turned on.

With the help of a screwdriver, the cassette is moved so that the first line filled with grain appears in the field of view. The field of view of the tool tilts the protective mask and the first line of grain is observed through the lens. Transparent grains (transmitting full light) and separate grains with a flour-like core (not completely transmitting light) are counted. When wheat grains of different types are observed under a diaphanoscope, the difference between them can be seen.

Grains that partially transmit light or partially do not transmit light are not taken into account. Then the cassette is moved with the help of a twisting handle, and the grains in the second row are observed.

Information about all 10 rows of grains is taken into account. The end of the last line is indicated by a red line above the cassette [23].

Separation of wheat grain into fractions (small and large grains).

The standards provide methods for determining the amount of relatively small grains in individual crop grains (seeds) and classifying grains into groups by size.

Wheat grain mass is a mass consisting of the sum of small and large grains. To separate this available mass into small and large grain fractions, "Sortimat" grain fractionation is carried out on the equipment manufactured by Pfeuffer (Germany).

The grain mass is automatically sifted in specially sized sieves designed to separate small and large grains (seeds).

Laboratory grain mill.

In grain quality analysis laboratories, in the course of certain laboratory analyses (determination of protein, fiber, starch, sugar, moisture, fat content and degree of hardness), finely ground wheat grain powder, that is, flour, is needed. In addition, it is possible to assess the baking properties of wheat grain after making bread. Therefore, it is required to have a laboratory grain mill that turns wheat grain into flour in each grain quality analysis laboratory.

LZM-1 Laboratory grain mill. This laboratory grain mill works with electric current, the principle of using the equipment is fully automated, that is, the user places about 30 grams of grain mass from the wheat sample cleaned from impurities in the steel cup of the equipment and then presses the "start" button after closing the lid. press As soon as the work process starts inside the iron container, the blades arranged in a fan shape at high speed instantly turn the grain mass into powder.

In the process of performing laboratory analyses, it is necessary to prevent overheating of the grain mill in order for it to function properly. Otherwise, when it is used without cooling, the motor installed in the equipment will burn and fail. Long-term operation of the device can be achieved if the rules are strictly followed when using the laboratory grain mill.

Determination of gluten quality.

One of the most valuable baking properties of wheat flour and wheat grain is the amount of gluten and its quality. The methodology of these indicators is determined according to GOST 13586. I-68 and 9404-60.

Gluten. The method specified in the state standard is used to determine the quantity and quality of wet gluten.

The content of gluten in high-grade bread should not be less than 28%, in the first grade it should not be less than 30%, and in the second grade, it should not be less than 25%. The gluten content of high-quality wheat flour used for making pasta products should not be less than 28%, and the gluten content of first-grade flour should not be less than 25%; Jaidari wheat flour's gluten content should not be less than 20%. The quality of gluten should not be lower than the second group.

The amount of gluten is expressed in relation to the measured mass of crushed grain. There are two types of gluten: wet gluten which has absorbed water and dry gluten - the final amount of gluten after drying. Depending on the amount of gluten in the composition, wheat grain can be classified as follows.

The main part of the protein in the grain of pea crops is water-insoluble (protein substance). Gluten is a flexible, sticky, and stretchy mass that is removed from the dough and does not wash off with water.

It mainly consists of wheat grain and can be up to 16-50%. Gluten consists of three amino acids, albumin, gliadin, and glutenin, which gives the dough its swelling or porous properties. The gluten content of the wheat grain is the reason for the good quality of the dough.

In terms of quality, the gluten content of the wheat grain is the highest. Accordingly, bread made from wheat flour is the highest in terms of nutrition and taste.

Quality groups of gluten in wheat grain

Display of IDK-1 instrument, scale unit	Quality unit	Description of gluten
From 0 to 15	3	Very unsatisfied
From 20 to 40	2	Very satisfying
From 45 to 75	1	Good
80 to 100	2	Weakly satisfactory
105 to 120	3	Unsatisfied without power

One of these equipments, "Informatik - 8620", is used to determine the protein, fiber, starch, sugar, moisture, fat content and hardness level of wheat flour. is brought to a state. Finely ground wheat is placed in the part of the equipment intended for analysis and compacted by pressing with a special press. Next, all indicators that are intended to be checked at the beginning of the equipment are selected and the "START" button is pressed.

Amount of wet gluten in wheat grain, %

Grain categories	Amount of wet gluten in grain, %
High gluten grain	above 30
Cereals with moderate amounts of gluten	26-29.9
Low gluten grain	20-25.9
Low-gluten cereal	Below 20

Zichlangan un orsadan uskunaning ish jarayonida qizil lazerli nur o'tkaziladi, shu jarayon natijasida tahlil qilinayotgan un namunaning tarkibida aniqlanilishi kerak bo'lgan barcha ko'rsatkichlar qisqa fursat ichida avtomatik tarzda uskunaning yuza qismida joylashgan ekranda hamda zarruriyat tug`ilganda qog`oz chekiga bosilib chiqariladi. [23]

CHAPTER III. RESEARCH RESULTS

3.1. Grain quality indicators and description

Batches of different varieties arrive from farms to grain receiving warehouses. The quality indicators of these grains and seeds determine their nutritional value and technological value.

In the studies, grain batches supplied to Koson DMQK LLC were analyzed.

The main method is based on comparative anatomical and laboratory analysis, and the quality of grain entering Koson DMQQ LLC is evaluated; efficiency of preparation of grain for grinding, characteristics of production technology were determined, main indicators of grain and flour quality were determined, economic evaluation of the enterprise was given.

Three grain batches obtained at Koson DMQQ LLC were analyzed.

3.2. Geometric indicators of grain

The scheme of separating grain from various mixtures, the description of the working bodies of machines for separating husks, husks, and groats, and the selection of working bodies of threshing machines depends on the shape and size of the grain. During the processes of moistening, heating and cooling of grain, changes in the size and structure of the outer surface of grain are of important technological importance [5].

Depending on the shape of the grain and the size of the grain, the technological drawing of the machine, air separator, and the working part of the clay, tpiep and grinding, whitener, and paste is determined. The quality of the grain and the surface of the grain are important in Japanese GTI [5,6,18]. The size of the grain is determined by the formula:

$$V = K \cdot \ A \cdot \ B \cdot \ l$$

where: A, V, l - grain width, thickness and length. K - the coefficient obtained from tajpiba; byg`doy, appa, javdap and cyli ychyn K=0.52.

This formula can also be used to determine grain size.

Size of wheat grain: a - length, b - width, v - thickness

Wheat grain a = 4.8 - 8.0 mm, b = 1.8-4.0 mm, v = 1.3-3.0 mm

Therefore, the influence of the grain shape on the even distribution of the load on the surface of the grinding shaft is of great technological importance when weighing flour, and it is necessary to study which geometric dimensions of the grains change depending on the humidity. In the process of weighing graded flour, the uniformity of the grains is ensured in the grain preparation section.

If the geometrical dimensions of grains of uniform size are studied at different humidity levels, the influence of their shape on the natural and friction angles of grains is concluded. It is known from the analysis of the literature that the effect of grain shape on the yield and quality of intermediate products (groats and flour) in the process of milling and grinding is known from the literature analysis. In the grain cleaning department of this mill, technological regimes have been developed in order to ensure grain uniformity [5,6,7,18].

As can be seen from the table below, the researched grain batches meet the requirements for wheat grain.

Table 3.1.

Description of the geometric dimensions of grains.

№	Grain party	Linear dimensions			size V, mm.	External surface area F, mm^2	V/F Ratio, mm.
		height, l	The width, a	Thickness, b			
1	1	4,08-7,41	2,3-4,1	2,2-3,1	28,5	73,2	0,41
2	2	3,95-7,33	2,3-3,8	2,0-3,0	26,7	68,4	0,39
3	3	3,75-7,14	2,4-3,5	2,0-3,1	25,8	67,7	0,38

According to the results of the research, the indicators of the three selected batches are close to each other in terms of their geometric parameters, and when the grain size changes in the range of 25.8-28.5 mm, the size of the 1st batch is the same as the 2nd and 3rd batches. was 0.9-2.7 mm more. These indicators, in turn, show their positive effect on the evaluation of the physical parameters of kernels and grains.

The results of the research show that as the grain size decreases, its surface area and volume also decrease. The outer surface area was the highest in the 1st batch of 73.2 mm2, as it is known that the amount of shell is high and the amount of kernel is less in small grains.

3.3. Quality indicators of grains taken for research

The technological characteristics of grain during flour milling are usually evaluated by flour yield and ash content. The profitability and quality of the finished product depends on the characteristics of the anatomical structure of the grain, the relative composition of the endosperm (kernel), the shape and size of the grain, the organization of the technological process and the characteristics of its fertility. The yield and quality of flour are directly affected by the humidity of the grain and the methods of its preparation and final processing (G. Egorov).

3.2. table.

Quality indicators of grains taken for research

Indicators	Unit of measure	Grain party		
		1	2	3
Moisture	%	9,6	9,5	8,6
Transparency	%	73	72	70
Nature	g/l	773	768	765
Mass of 1000 grains	g	41,0	40,6	40,5
Laughter	%	1.63	1,68	1,72
Amount of dry gluten	%	26,5	25,8	25,2
IDK indicator		82	90	95
Density	g/sm^3	1.33	1,35	1,28
Pollution	%			
A foreign mixture		2,5	1,9	2,1
cereal mixture		2,8	2,6	2,8

The quality indicators of grains taken for research are presented in the table below.

As can be seen from Table 3.2, all the values of the quality indicators of the grain batches taken for the study are close to the quality indicators of other grains taken for comparison.

The transparency index expresses the characteristics of the grain kernel structure and is used for wheat, rice, barley, rye, and triticale grains.

When flour is sifted from vitreous grains, the kernel is easily separated, and the flour has high baking properties. The coarse and ground groats made from vitreous barley grains ripen quickly, and the groats themselves have a good product appearance.

Three groups of vitreousness have been established for wheat grain in flour weighing practice: up to 40%, from 40 to 60%, and above 60%. In the formation of flour weighing categories, the level of vitreousness is kept at 50-60% [14].

When we determined the vitreousness of the grains, it was 73% in the 1st batch, 77% in the 2nd batch, and 70% in the 3rd batch.

Thus, the vitreousness of the researched wheat grains corresponds to the standard requirements for wheat grain intended for flour production.

The nature of the grain is one of the main indicators that evaluate its technological properties. The nature of grain depends on many factors. They include grain sphericity, density, size, condition of the grain surface, the number of impurities in the grain mass, and its types.

The volumetric weight of grain is the weight expressed in grams of 1 liter of grain. The greater the volume weight of the grain, the better it is developed and the larger it is. Volumetric weight depends on grain shape, moisture, size, contamination, and type of impurities.

Experiments show that the volumetric weight of grain cleaned of impurities has a positive effect on the yield of flour. If the volumetric weight is less than 740 g/l, the yield of flour decreases by 1% for every 17 g/l, even a 13 g/l decrease in the volumetric weight. When the volume weight is higher than 740 g/l, its effect is less, when the volume weight decreases, the quality of flour deteriorates [16].

When we determined the nature of grains, the nature of grains was equal to 773 g/l in the 1st batch, 768 g/l in the 2nd batch, and 765 g/l in the 3rd batch.

According to the obtained results, it can be concluded that the set value is high-quality grain. These results indicate that it is possible to obtain high-quality and productive flour from the studied wheat batch.

The mass of 1000 grains, that is, the absolute mass, is an important indicator of the technological properties of the grain. This indicator is positively associated with grain size, transparency, and density, so it has a significant impact on the technological properties of the grain.

In shelled (cereal) grains, the amount of kernel decreases along with the decrease in the mass of 1000 grains, at the same time, their shelliness increases.

In the weighing of wheat flour, the yield of flour is 3-5% higher in the large fraction weighing more than 40 g of 1000 grains, compared to the small fraction weighing less than 23 g of 1000 grains [15].

The larger the grain, the greater the mass of 1000 grains. The mass of 1000 grains in the 1st batch is 41.0 g, and due to the fullness of the kernel and the larger size than the grains of other batches, it also shows a relatively high yield.

Thus, the mass of 1000 grains of the studied wheat samples meets the standard requirements for wheat grain intended for flour production.

The ash content of the studied wheat grains was determined in a muffle furnace using the standard method for determining grain ash content in laboratory conditions.

Grain ashiness indicates the amount of later digestible substances in the grain. The level of ash is equal to the amount of ash formed by placing the ground grain in a muffle furnace, calculated in percentages compared to the weighted mass accepted for analysis.

According to the obtained results, the grayness index of the grain corresponds to the established norms. The flour quality of the researched wheat samples allows obtaining flour with high quality and output that meets the standard requirements if the technological process is properly designed and managed.

The main part of the protein in the grain of pea crops is water-insoluble (protein substance). Gluten is a flexible, sticky, and stretchy mass that is removed from the dough and does not wash off with water.

The content of gluten in high-grade bread should not be less than 28%, in the first grade - 30%, and in the second grade - 25%. The gluten content of high-quality wheat flour used for making pasta products should not be less than 28%, and the gluten content of first-grade flour should not be less than 25%; Jaidari wheat flour's gluten content should not be less than 20%. The quality of gluten should not be inferior to the second group [13].

It mainly consists of wheat grain and can be up to 16-50%. Gluten consists of three amino acids, albumin, gliadin, and glutenin, which gives the dough its swelling or porous properties. The gluten content of the wheat grain is the reason for the good quality of the dough.

In terms of quality, the gluten content of the wheat grain is the highest. Accordingly, bread made from wheat flour is the highest in terms of nutrition and taste [15].

The researched grain showed good parameters of gluten content and quality of batches.

When we determined the amount and quality of gluten in the researched wheat grains, the highest indicator was found in the 1st batch.

The amount and quality of gluten in these wheat grains meet the standard required for weighing flour.

3.4. Effect of physical and chemical properties of grain on flour yield

In different grinding methods, different amounts of flour can be obtained from the same type and the same amount of grain. The amount of flour obtained as a percentage of the total weight of crushed, i.e., processed grains and mixtures represents the yield of flour.

For each type of flour, the amount of basic (primary) output is determined in all methods of crushing. When processing grain with basic parameters, it is considered the main obligation of the grain mill to fulfill the standards set for the output of flour (in a certain assortment). For this reason, all the parameters affecting the output of the product are reflected in the basic solution conditions.

Often, the actual quality indicators of the grain brought to the mills do not correspond to the basic conditions. It is found that the conditions of grain sent to the mill from grain storage warehouses are lower, higher, or more suitable. At such points, the actual output is calculated and the calculated output is determined. The calculated output serves as an obligation for the mill in the processing of grain with certain quality indicators. When the outputs are calculated, the actual quality indicators of the grain are compared to the basic quality indicators, and differences are determined separately for each indicator. Then, the change in output is determined, and output standards are calculated depending on grain quality.

The calculation is carried out separately for each quality indicator, and the proportional output change is determined for all types of products.

Standard changes calculated for individual indicators are summed up and added to the base output or subtracted from it. As a result of these calculations, the calculation output is determined.

According to the number of polluting compounds, for each % of the polluting mixture above the base standard, the amount of flour and bran output decreases by 1.0%, and the output of bulk waste increases.

If the amount of polluting compounds is lower than the basic indicators, the output of flour and bran increases and the output of solid waste decreases.

The actual output is quite different from the calculated output. This situation can be explained in two ways: the ashiness index cannot accurately determine the composition of the kernel; different externalization of the technological process in each mill.

The actual output from threshing is determined by the ratio of the weight of the product measured after threshing to the weight of the grain arriving at the grain cleaning department of the mill.

The moisture content of grains arriving at grain enterprises is in most cases around 8-9%. Grains with such moisture can be processed on the basis of existing technology without preliminary moistening and moistening processes.

If we draw a conclusion based on the obtained results, when making flour from grains with a moisture content higher than 9.5 - 10.5%, they may not be subjected to additional hydrothermal treatment, because the color and quality of the product will change. indicators also correspond to the output and quality requirements of the flour obtained from the laboratory mill. Additional GTI is recommended for grains with a moisture content of less than 9.5% because it is possible to achieve a complete separation of the kernel and the shell due to 2 times soaking and moistening of extremely dry grain. This can be seen from the yield and quality indicators of the Hasildar variety.

Tables 3.3 show the product output based on the quality indicators of grain batches taken for research.

Table 3.3

Quality indicators of grain batch (average)

Indicator name	Standarts	Real
nature	750	768
Moisture,%	14,5	9,2
laughter	1.97	1.67
Gluten,%	Not inferior to the second group	25.8
impurity, %	2	2.1
Cereal mixture,%	5	2,7
Viscosity, %	50-60	71.6

The analysis of the average data obtained from the grain shows that the grain supplied to Koson DMQQ LLC meets the standard requirements. The enterprise uses different types and subtypes, old and new crops, good and low quality grain. The difference in the quality of grain complicates and reduces the process of its processing, requires correcting the operating modes of technological systems. Ensuring the stable operation of the mill, increasing the production of high-grade flour, improving its quality, and using the existing grain in the enterprise correctly, mixing the grain and grinding batch.

3.5. Determination of large and small grain fractions.

The larger the grain of wheat, the greater the ratio of the endosperm part to the total volume of the grain. This indicator meets the requirements for obtaining high-quality flour from wheat grain. As the grain size decreases, the output of the obtained product decreases and its quality deteriorates. [21]

Therefore, in order to improve the technological properties of wheat grain, as well as to increase the efficiency of cleaning from contaminants and grain mixtures, the small grain fraction is separated from the grain batch, and the large grain flow is sent to get flour.

To determine the size of the wheat grain, a complex of halves is used.

Small grain fraction was separated from the analyzed wheat varieties in accordance with existing regulatory requirements. The results of the separation of the fine grain fraction according to GOST 13586.2 - 81 and GOST 9353 - 90 standards are presented in the table below.

Table 3.5.

Indicators of grain fractions

Parties	Initial state		Elash results			
	Grain mass, %	Fine grain fraction, %	Large mixtures,%	Large grain fraction, %	Fine grain fraction, %	Fine mixtures, %
1st batch	100	14,8	2,9	71,3	8,1	2,9
2nd batch	100	14,7	2,6	70,6	8,8	3,3
3rd party	100	14,1	2,7	70,9	8,2	4,1

It can be seen from the table that the extracted large grain fraction was 71.3% in the 1st batch, 70.6% in the 2nd batch and 70.9% in the 3rd batch.

The large grain fraction of the grain of the studied samples is at the level of requirements and allows to obtain flour with a high yield.

3.6. Technological properties of fractionated grains.

The larger the grain size in fractionated grain batches, the better its technological properties. In the small grain fraction, these indicators do not meet the standard requirements, and it is appropriate to send them to the production of mixed fodder.

When determining the quality indicators of grain divided into fractions, the quality indicators decreased as the grain fraction decreased.

The output and quality of the finished product objectively determine the technological properties of the grain. These indicators significantly change under the influence of various factors, namely, the size of the grain, its completeness, the relative amount of kernel, humidity, and similar factors [5,6,18,29].

The main factors affecting the yield and quality of grain are its size and flattening. Smaller grains have less endosperm and their ashiness increases.

Table 3.6.

Quality indicators of grain divided into fractions.

Wheat parties	Grain fractions	Mass of 1000 grains, g	Nature, g/l	Vitreous, %
1st Batch	2a-2.5x20 galvir remains	41,3	790	77,0
	$\frac{2a-2,5x20}{2a-2,2x20}$	18,2	628	61,5
	$\frac{2a-2,2x20}{2a-1,7x20}$	8,0	586	44,3
2nd batch	2a-2.5x20 galvir remains	39,9	788	76,8
	$\frac{2a-2,5x20}{2a-2,2x20}$	18,6	613	59,6
	$\frac{2a-2,2x20}{2a-1,7x20}$	8,3	567	43,1
3rd party	2a-2.5x20 galvir remains	39,1	772	69,0
	$\frac{2a-2,5x20}{2a-2,2x20}$	17,6	618	59,7
	$\frac{2a-2,2x20}{2a-1,7x20}$	7,5	493	53,1

When determining the quality indicators of grain divided into fractions, the quality indicators decreased as the grain fraction decreased.

Fraction reduction: the weight of 1000 grains decreased by 33.3 g in the 1st batch, 31.6 g in the 2nd batch, and 31.6 g in the 3rd batch. Similarly, the nature of the grain decreased to 204-279 g/l, the vitreousness of the grain decreased to 32.7-19.9%.

The output and quality of the finished product objectively determine the technological properties of the grain. These indicators change significantly under the influence of various factors, i.e. the size of the grain, its completeness, the relative amount of kernel, humidity and similar factors.

Table 3.7.

Flour characteristics of fractionated grains.

Grain party	Grain fractions by size	Flour outputN, %	The softness of the flourZ, %	Technological indicatorK=N/Z
1st Batch	2a-2.5x20 galvir remains	74,4	0,85	83,2
	$\frac{2a-2,5x20}{2a-2,2x20}$	66,4	0,93	80,2
	$\frac{2a-2,2x20}{2a-1,7x20}$	60,8	1,12	60,4
2nd batch	2a-2,5x20 galvir remains	73,5	0,88	82,6
	$\frac{2a-2,5x20}{2a-2,2x20}$	65,3	0,95	78,5
	$\frac{2a-2,2x20}{2a-1,7x20}$	59,7	1,20	59,6
3rd batch	2a-2,5x20 galvir remains	72,5	0,89	82,5
	$\frac{2a-2,5x20}{2a-2,2x20}$	64,2	0,97	74,5
	$\frac{2a-2,2x20}{2a-1,7x20}$	58,5	1,22	53,6

The main factors affecting the yield and quality of grain are its size and flattening. Smaller grains have less endosperm and its ashiness increases.

Table 3.7 shows the effect of grain size on yield and ashiness of flour extracted from wheat varieties in LZM-1 laboratory mill.

The conducted studies show that if the grain preparation and milling processes are carried out separately according to size fractions, the yield of high-grade flour can be increased by 8-11%.

CHAPTER IV. WHEAT GRAIN FLOUR PRODUCTION TECHNOLOGY AND ITS ECONOMIC EFFICIENCY

4.1. Technological calculation of the grinding department of the mill

4.1.1. Calculation of shaft machines.

The grinding line of the shaft machine in any system is found from the following formula:

$$L_i = \frac{Q * 1000 * X_i}{q_i * 100}$$

Here:

Li = the length of the grinding line in the given systems, cm;

Q = given productivity of the mill, t/milk;

qi = specific load corresponding to 1 cm crushing line in the given system, kg/milk;

Xi = amount of products falling into the given system according to the balance, %; table 3.1

Table 3.1

Systems	Loading, ,%	Specific load on the shaft, kg/cm.sut	The length of the grinding line, cm	Actual length	Number of machines	The size of the workshop
I yo.s	96,5	800-1200	$l = \frac{96{,}5*60*1000}{1100*100} = 58$	60	0,5	600*250
II yo.s	60	600-900	$l = \frac{60*60*1000}{750*100} = 48$	60	0,5	600*250
III yo.s	37,5	400-900	$l = \frac{37{,}5*60*1000}{500*100} = 45$	60	0,5	600*250
IV yo.s	26,5	250-400	$l = \frac{26{,}5*60*1000}{300*100} = 53$	60	0,5	600*250
I ya.s	30	280-360	$l = \frac{30*60*1000}{350*100} = 61$	60	0,5	600*250
II ya.s	17,5	220-300	$l = \frac{17{,}5*60*1000}{250*100} = 42$	60	0,5	600*250

3 VM - 2P machine tools with markings are accepted.

4.1.2. Calculation of sieves.

According to the systems, the sieving surface is found as follows:

$$S_i = \frac{Q * 1000 * X_i}{q_i * 100}$$

Where :

X_i = the amount of products entering the system according to the balance, %;

q_i = specific load corresponding to the sieving surface, kg/m2.sut

3.6.2 – table.

3.2 - table.

Systems	The balance amount,%	Comparative load norm, kg/m2	Calculated surface area, m2	Real surface, m^2	Number of sections
I yo.s	96,5	20000	$f = \frac{96{,}5*60*1000}{20000*100} = 2{,}9$	4,7	1,0
II yo.s	60	14500	$f = \frac{60*60*1000}{14500*100} = 2{,}5$	4,7	1,0
III yo.s	37,5	10000	$f = \frac{37{,}5*60*1000}{10000*100} 22{,}5$	4,7	1,0
IV yo.s	26,5	8000	$f = \frac{26{,}5*60*1000}{8000*100} = 1{,}99$	4,7	1,0
I ya.s	30	7000	$f = \frac{30*60*1000}{7000*100} = 2{,}57$	4,7	1,0
II ya.s	17,5	7000	$f = \frac{17{,}5*60*1000}{7000*100} = 1{,}5$	4,7	1,0

1 R3 - BRB sieve is accepted.

4.1.3. Calculation of necessary centrifuges for flour control.

$$n_i = \frac{X_i * Q}{100 * 24 * q_m};$$

Where :

n_i = the number of centrifuges required for a given variety;

Q = mill productivity, t/milk;

q_m = productivity of the machine, t/milk;

$$n_{1n} = \frac{50{,}5 * 60}{100 * 24 * 0{,}75} \quad 1{,}8$$

1 variety is accepted into 2 R3-BSA centrifuges for flour control.

$$n_{2n} = \frac{28{,}5 * 60}{100 * 24 * 0{,}75} = 1{,}02$$

1 R3-BSA centrifuge for 2nav flour control

№	Machine name	Machine number	Product name		Where is it going?	Pipe number	pneumotrans	With a conveyor	Noriya bilan	Quvurlarning qiyalik burchagi		Tekshirish	Eslatma
			falls	comes out						me'yoriy	haqiqiy		
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	Unrefined grain bunkers No. 1,2,3	3	Don	Don	URZ – 1	1	-	-	-	34	65	2	
2.	UPZ – 1	3	Don	Don	Tarozi – D – 20	2	-	1	-	-	90	2	
3.	The scale – D – 20	1	Don	Don	Noriya kovushi	3	-	-	1	34	71	1	
4.	Separator BMS – 6	1	Don	Don	A1 – BMS – 6	4	-	-	1	-	42	4	
5.	Noriya Kovushi	1	Don	Don	Tosh aj. RZ – BKT	5	-	-	-	-	68	3	
6.	RZ – BKT	1	Don	Don	Urib toz. RZ – BGO	6	-	-	-	-	62	2	
7.	RZ – BGO – 6 №2	1	Don	Don	2 – noriya kovushi	7	-	-	-	-	53	1	
8.	2- noriya kovushi	1	Don	Don	A1 – BShU – 2	8	-	-	2	-	48	4	
9.	A1 – BShU – 2	1	Don	Don	Namiqtirish bunkerlari	9	-	2	-	-	90	4	
10.	Namiqtirish	7	Don	Don	3- noriya	10	-	-	-	45	65	2	
11.	UPZ – 1	2	Don	Don	II namiqtirish bunk.	11	-	-	-	-	70	1	
12.	3- noriya kovushi	1	Don	Don	RZ – BGO – 6 №2	12	-	-	3	-	68	4	
13.	II namiqtirish bunkeri	1	Don	Don	4-noriya kovush	13	-	-	-	45	53	2	
14.	RZ – BGO – 6 №2	1	Don	Don	A1 – BAZ	14	-	-	-	45	71	1	
15.	4- noriya kovushi	1	Don	Don	Iyo.s.oldidagi bunker	15	-	-	4	45	48	4	
16.	A1 – BAZ	1	Don	Don	Tarozi D – 20	16	-	-	-	45	90	4	
17.	I yorm.sis.bunkeri	1	Don	Don	№ 5 noriya	17	-	-	-	45	55	2	
18.	Chiqindi yig' konveyr	Chiq	Chiqindi	Chiq	kovushi	18	-	5	-	50	80	1	
19.	5 – noriya kovushi	1	Chiq	Chiq	Burat IMB – 3	19	-	-	5	50	52	4	
20.	SMB – 3	1	Chiq	El.3kat.chiq.	III kategoriya.chiq.	20	-	-	-	50	61	3	
21.	SMB – 3	1	Chiq	Qoldiq	tarozi D – 20	21	-	-	-	50	60	3	
22.	A1 – BDA	1,0	Chiq	I va II kate-	A1-BDN aspir.DDM	22	-	-	-	50	82	2	

23.	Maydalagich ADM	1,0	Chiq	goriyali	6-noriya kovushi	23	-	-	-	50	61	1	
24.	6 – noriya kovushi	1,0	Chiq	chiqindi	I va IIkt.chiq.tar D-20	24	-	-	6	50	78	3	
25.	U1 – BPM I yorm . sis.	1,0	Don	Don	Iyo.s.valli dastgohi	25	-	-	-	45	80	1	
26.	VT yor.s.valli dastgohi	1,0	Don	Iyo.s.mah	Iyo.s.elak.mag.ajrat	26	1	-	-	45	68	3	
27.	I yor.s. elakdoni	1,6	Mah	1 qoldiq	1ya.s.mag.ajrat.	27	-	-	-	45	54	2	
28.	I yo.s. elakdoni	1/6	Mah	2,3 qoldiq	Konveyr №6	28	-	-	-	45	46	2	
29.	I yo.s. elakdoni	1/6	Un	1nav un	val das	29	-	-	-	50	54	2	
30.	Iiyo.s.mag.aj U1 – BMP	1,0	Un	Mahsulot	II yo.s.elak.	30	2	-	-	45	80	1	
31.	Iiyo.s. elakdoni	1/6	Un	Iiyo.s.mah.	II yo.s.mag .ajrat.	31	2	-	-	45	68	3	
32.	Iiyo.s. elakdoni	1/6	Iiyo.s.mah	1 qoldiq	1ya.s.mag ajratgich	32	-	-	-	46	58	2	
33.	Iiyo.s. elakdoni	1/6	Mah	2,3 qoldiq	Koveyr № 6	33	-	-	-	46	50	2	
34.	Iiyo.s. elakdoni	1/6	Mah	1va2 elanma	III yo.s valli.dast.	34	-	-	-	50	58	2	
35.	IIIyo.s.mag.aj U1– BMP	1,0	Mah	Un 1nav	III yo.s elakdon	35	-	-	-	45	73	1	
36.	IIIyo.s.mag.aj U1-BMP	0,5	Mah	Mahsulot	IV yo.s.mag.ajratgich	36	3	-	-	45	68	3	
37.	IIIyo.s.mag.aj U1 - BMP	1/6	Mah	1,2,3 qoldiq	Konveyr № 7	37	-	-	-	46	46	2	
38.	IIIyo.s.mag.aj U1 - BMP	1/6	Mah	1,2el2nav un	1 ya.s. valli.dastgoh	38	-	-	-	52	54	2	
39.	1ya.s.mag.aj U1 -BMM	1,0	Mah	Mahsulot	1 ya.s. valli.dastgoh	39	-	-	-	52	56	1	
40.	1ya.s.mag.aj U1 -BMM	0,5	Mah	Mahsulot	1ya.s. elakdoni	40	4	-	-	46	68	3	
41.	1ya.s.mag.aj U1 - BMM	1/6	Mah	1,2,3,4 qold	Konveyr	41	-	-	-	49	52	2	
42.	1ya.s.mag.aj U1 -BMM	1/6	Mah	Elanma un	2 ya.s. valli dastgoh	42	-	-	-	49	76	2	
43.	2ya.s.mag.aj U1 -BMM	1/6	Mah	Mahsulot	2 ya.s. valli dastgoh	43	-	-	-	50	68	1	
44.	2ya.s.valli dastgohi	0,5	Mah	2 ya.s.mah.	IVyo.s.mag.ajratgich	44	5	-	-	50	86	3	
45.	2ya.s.elakdoni	1/6	Mah	1,2,3qol.elan	Konveyr	45	-	-	-	46	60	2	
46.	2ya.s.elakdoni	1/6	Mah IV	Un 2 nav	IVyormalash.sistema.	46	-	-	-	50	73	2	
47.	IVyo.s.mag. aj.U1- BMP	1,0	yo.s.mah	Mahsulot	Valli dastgoh	47	-	-	-	46	68	1	
48.	IVyo.s.valli dastgoh	0,5	Mah	Mahsulot	IVyo.s.elakdon	48	6	-	-	46	64	3	
49.	IVyo.s.elakdon	1/6	Mah	1,2,3 kepak	Tayyormah.sexi	49	7	-	-	47	58	2	
50.	IVyo.s.elakdon	1/6	Mah	Elan 2 n.un	Konveyr № 7	50	-	-	-	52	66	2	
51.	1 nav un konver.№6	1,0	Qoldiq	Un 1 nav	R3 – BUA № 1,2	51	8	-	-	50	61	3	
52.	R3 – BUA №1,2	2,0	Un 2nav	Un 1 nav	Tayyor mah.sexi	52	9	-	-	50	60	2	
53.	R3 – BUA №1	1,0	Qoldiq	Un 1 nav	1 ya.s. mag.ajratgich	53	-	-	-	48	54	2	
54.	R3 – BUA №2	1,0	Un 2nav	Un 2 nav	1 ya.s. mag.ajratgich	54	-	-	-	48	56	2	
55.	2 nav un konver №7	1,0	Un 2nav	Un 2 nav	R3 – BUA № 3	55	10	-	-	52	70	3	
56.	R3 – BUA №3	1,0	Qoldiq	Un 2 nav	Tayyor mah.sexi	56	11	-	-	52	61	2	

57.	R3 – BUA №3		Qoldiq Qoldiq	qoldiq	IVyo.s.mag.ajratgich	57	-	-	-	48	56	2	

4.1.4. Calculation of ventilation and pneumatic transport equipment. Aspirating equipment.

3.4.-jadval

№	Make of the car	Numbers	Located floor	Air consumption		Pressure consumption	Filter and fan
				For 1 car	Intotal	Pa	
1.	Untreated grain bunkers Libra D – 20	2	3	300	300	100	—
2.	Noriya trubalari	1	2	420	420	50	—
3.	NS , № 1,2 Ajratgich	2	1	300*2	1200	270	RSI-15,6-24
4.	A1 – BIS – 6 Qobiq ajratgich	1	4	1550	1550	140	RZ – BV – s5 37 – 5,3 01O'Z
5.	RZ – BTO – 6 Aspirator	1	2	300	300	140	
6.	RZ – BNA – 50	1	2	2400	2400	350	
	Q = 6170 m^3/g						
1.	Qobiq ajragich RZ – BGO – 6	1	2	300	300	140	—
2.	Aspirator RZ – BNA – 50	1	2	2400	2400	350	—
3.	Tarozi D – 20	1	2	120	420	50	10,4 – 16
4.	Noriya trubalari NS , № 3,4	2	1	300*2	1200	150	RZ – BV – s5 37 – 5,3 01 O'Z
	Q = 4320 m^3/g						

PTK accounting table **Table-3.5**

Pneumatic transport	System name	Product quantity kg/hour		The amount of mixture is periodic	Air consumption, Qpr cm3/min	Standard diameter	Razgrozitel brand
		On balance	On account				
	1stol						
	I yo.s	2375	2731	4,0	9,5	100	S – 290 – 3
	II yo.s	1260	1449	4,0	5,0	70	S – 250
	III yo.s	641	737	4,0	2,6	56	S – 160
	IV yo.s	441	507	4,0	1,8	56	S – 160
	I ya.s	777	894	4,0	3,1	60	S – 190
	II ya.s	368	423	4,0	1,5	55	S – 160
$Q = 22{,}1\ m^3/g$							
	2-stol						
	Un 1-nav	1145	1316	4,0	4,6	70	S – 250
	Un 2-nav	516	592	4,0	2,1	56	S – 160
$Q = 6{,}7\ m^3/g$							

$$Q = 22{,}1 + 6{,}7 = 28{,}8\ m^3/min$$

For the threshing department, we choose the RSI-52-8 filter and the TV-80-1.2 air blower..

4.2. Quality indicators of dough

Bread production consists of five interrelated technological stages: preparation of raw materials, preparation of dough, baking, cooling and storage of bread.

Due to the ability of the dough to generate gas as a result of fermentation and its physical properties, it shows good properties for baking bread. The sum of the physico-chemical processes that take place in this determines the formation of the dough.

Currently, new methods for preparing dough in an accelerated and continuous flow method have been developed and are being used. In this case, increasing the mechanical processing of the dough, increasing the amount of pressed and liquid yeast, and increasing the temperature of the dough.

Some enzyme preparations: α and R -amylase, r - fructofuranosidase, glucoamylase, glucose oxidase, lactase, etc. are used with success in baking.

Table-3.4.

Quality indicators of dough

Indicators	Unit of measure	1st grade flour (mill)	flour obtained in laboratory conditions
Acidity	grad		
Primary		2,25	2,27
The last one		3,48	3,52
PN		5,28	5,29
Lifting power	min	9,0	9,2
The ability to generate gas	sm^3	1298	1312
Ability to retain gas	sm^3	33	41
A ball of dough		0,38	0,43

The quality parameters of flour of the 1st grade in the mill from naman obtained for the experiment and the dough made from it in the laboratory do not differ from each other. The quality of dough meets standard requirements.

4.3. Baking properties of flour.

In accordance with the rules of organization and management of the technological process, one, two and three varieties of jaidari flour are produced in flour factories.

The chemical composition of jaidari flour differs little from that of grain. The fruit shell and bud are separated from the grain. As a result, the ash content of jaidari flour is 0.07-0.10%, and the amount of fiber is large compared to grain and is not the same in size. The amount of gluten from it depends on the grain quality [7,21,46,47].

Grinding flour, i.e. taking several types of flour at the same time, is controlled according to the principle of step-by-step grinding.

From each subsequent stage of crushing, pieces with different physical properties are obtained. They are divided into fractions and divided into the same parts according to their composition.

Intermediate products of threshing and a small amount of flour products are taken from each stage and transferred to the formation of one or another type of flour. The method of step-by-step grinding of wheat is based on the use of differences in the structural and mechanical properties of the endosperm and the shell, which increases further after hydrothermal treatment of the grain.

The main task of multiple step-by-step grinding is to reduce the breakage of the shell and extract the core from the grain as much as possible.

91.2% of the starch and 72.2% of the total protein of the grain of wheat flour yielded 75%. The amount of protein in dry gluten is 90.8% [21,49,50].

In the process of flour milling, along with the separation of the peripheral layers of the grain, bran and other wastes are separated from the flour, as well as many vitamins. That is why vitamins are added to flour in order to vitaminize it in flour factories.

Table-3.8.

The norm of adding vitamins to it. (in terms of mg per 100 g of flour)

Wheat flour variety	Tiamin (B_1)	Ribovlavin (B_2)	Niatsin PP
High	0,4	0,4	2,0
First	0,4	0,4	2,0

The final stage of the technological process of grain threshing is the process of forming flour streams. The chemical composition and biochemical properties of flour streams obtained during step-by-step grinding are taken into account when forming flour varieties. In this case, if the proportion of the endosperm starchy core zone, the amount of bran part is standard, the requirements for each variety (greyness, size, gluten content, color, organoleptic evaluation) are taken into account.

In all cases, enterprises of the flour industry should try to fully meet the requirements of the flour-producing industry in terms of the quality composition and technological properties of flour.

In grain processing, there is a need to adjust the quality of flour in order to meet the needs of bakeries and other enterprises for high and stable quality flour. In foreign mills, for this purpose, wheat flour is added to improve the quality of bread, for example, an enzyme preparation containing 2-amylase.

In Russia, the use of improvers to increase feed value and ensure the production of flour meets standard requirements is at the initial stage. Soil-climatic conditions and agrotechnological processes lead to changes in its quality, and this was confirmed when researching the harvest of recent years. Due to the different quality of grain batches, the problem of stabilizing the quality of weighing batches arises.

In addition, the quality of wheat grain has been decreasing in recent years. Wheat of high commodity quality is not available, most of the commodities are low-grade 3-4 grains.

One of the ways to improve the baking properties of flour is to use special processing technologies that allow the separation of defective diseased grains or anatomic parts that worsen the baking properties.

The use of baking quality improvers is one of the convenient ways to control the quality of flour and bread. This situation allows control and forecasting with sufficient accuracy. Unfortunately, this thing is used in practice only in baking enterprises.

Currently, importance is given to the use of complex improvers. They affect different substances of flour at the same time.

The improver should be of a powdery type with a certain size, no larger than the size of flour particles, and it can be sprinkled well for accurate measurement, and it can mix well with flour.

Its moisture and hygroscopicity should be low, its color should be light, it should not change the color of the flour, and its shelf life should not be less than that of wheat flour. Although the enhancer is relatively cheap, its use should be economically feasible.

The main reason for the deterioration of the marketability of wheat grain is the low amount of gluten. Even in a wheat grain of the 3rd class, the amount of gluten is at a lower level and does not exceed 23%. 3rd class wheat flour does not always meet the requirements of GOST 26574-85.

Baking properties are improved by adding dry wheat gluten to the low-gluten content.

Dry wheat gluten shows a finely dispersed, light-colored powder, has low moisture, flows well, and allows to correct the common defects of low-quality flour without worsening the organoleptic indicators of flour.

Dry gluten is a natural substance and its amount is not limited when used as an additive.

Dry wheat gluten is added to flours that are already low in protein in flour mills in France, the USA and other countries. In European countries, dry wheat gluten is added to it. In Russia, dry gluten is mostly added to bakery improvers. This makes it possible to increase the water absorption capacity of the dough, to improve its physical properties, to increase the quality indicators of bread, including the structural-mechanical properties of the core, the yield and shelf life of bread products [51,52,54].

In our work, we experimentally added dry wheat gluten to it obtained from wheat grains belonging to the 4th grade, and the amount of wet gluten in each standard percentage of dry wheat gluten was 1.6-2%. we found that it has increased to

2-4% of dry wheat gluten should be added to the flour obtained from class 4 grains to bring the quality indicators of the flour up to the standard requirements.

When dry wheat gluten was added, the physical properties of the dough made from weak flour increased to the level of strong dough. Adding more than 4% dry wheat gluten does not improve the baking properties of the flour much. Therefore, it is recommended to add 3-4% dry wheat gluten to the baking flour.

As a result of transfer of dry wheat gluten at the rate of 3-4%, it is ensured that the quality of gluten changes from the III-unsatisfactory weak group to the II-unsatisfactory group.

Table-3.9.

Changes in the baking properties of flour due to the addition of dry wheat gluten.

T/r	Event name	The result achieved
1	in each added percentage of QBK	Flour gluten increases by 1.6-2%
2	Add QBK in the amount of 2-4%	The quality of the flour obtained from the 4th grade grain met the requirements of GOST 26574
3	Maximum inclusion rate of QBK	Not more than 4%
4	Addition of QBK in the amount of 3-4%	The quality of flour gluten

4.4. Wheat grain flour production technology and its economic efficiency

4.4.1. Calculation of capital funds

Table-4.1.

Let's make a list of the necessary equipment:

Device name	Model	Number, unit	The price of one, soum	The price of everything is cheap	Transportation and assembly costs, soum	Total value, soum
Noria	Noriya-175	2	250000	500000	75000	575000
Libra	DN-100-2	2	250000	500000	75000	575000
Transporter	TS-100	2	320000	640000	96000	736000
Washing machine	J9-BMA	2	350000	700000	105000	805000
Humidifier	A1-BSHU-1	1	450000	450000	67500	517500
Whitening equipment	R3-BMO-12	1	300000	300000	45000	345000
Separator	A1-BIS-12	1	360000	360000	54000	414000
Stone separator	RZ-BKT-9	1	400000	400000	60000	460000
Cleaner	RZ-BAB	1	450000	450000	67500	517500
Trier	A9-UTO-6	1	300000	300000	45000	345000
Dispenser	URZ-1	1	150000	150000	22500	172500
Magnetic column	U1-BMP - 01	1	100000	100000	15000	115000

Aspirator	BDA	1	640000	640000	96000	736000
Concentrator	BZK-18	1	300000	300000	45000	345000
TOTAL:		18		5790000	868500	6658500

So, $\sum X_{м}^{ум} = 6658500$

The number of equipment is 18 pieces.

Table-4.2.

Material costs for the finished product.

№	Raw material	Amount	Unit of measure	Unit price, soum	Price of all, soum	Transportation and storage costs, soum	Total value, soum
1	Grain	1000000	kg	1450	1450000000	14500000	1464500000
2	Vitamin	32,8	kg	53000	1738400	260760	1999160
3	QBK	3200	kg	45000	144000000	21600000	165600000
	Total:				1595738400	36360760	1632099160

Table-4.3.

Technical costs

№	Raw material	Amount	Unit of measure	Unit price, soum	The price of all, soum
1	Bag	16500	dona	200	3300000
	Total				3300000

So, $S_{м}^{ум} = S_{м}^{т.м} + S_{м}^{тех.хар}$ = 1632099160+3300000=1635399160

The cost of auxiliary equipment in the unit is 30% of the cost of the main equipment, i.e

$$У_{ёр} = 0{,}30 * \sum X_{м}^{ум} = 1997550$$

Thus, the value of the asset part of fixed assets:

$$K_a = \sum X + Y_{ёр} = 6658500+1997550=8656050$$

4.4.2. We find the value of the technological department and the building where it is located

We find the value of the main building:

$$K_б = S_{ум} * \mu = 2402*35000 = 84084000 \text{so'm}$$

μ =The amount spent on 1 m2 is 35,000 soums.

Thus, the cost of the unit's capital is:

$$K = K_a + K_б = 8656050+28828800=37484850 \text{ soums}$$

We take the coefficient of appreciation as 1.08, then:

$$K = 37484850*1{,}08=40483638 \text{ soums}$$

The amount of normalized working capital is 30% of the main means of production of the division:

$$A_м = 0{,}3 * K = 0{,}3*40483638=12145091{,}4 \text{ soums}$$

4.4.3. We calculate the cost of the finished product

8 people work in the flour production enterprise. 3 engineers and technicians.

So, 3 of these workers work in the VII grade, 2 in the VIII grade, 2 in the IX grade, 2 in the X grade, and 2 in the XI grade.

The minimum wage is 223,000 soums. $S^a_{u.x} = (4{,}284*3+4{,}640*2+4{,}997*2+5{,}362*2+5{,}733*2)=(10{,}452+7{,}546+8{,}128+8{,}73+9{,}336)*223000=9854816$ soums

Now we calculate the overtime pay of the main workers. This salary is 15% of the basic salary:

$$S^к_{u.x} = 0{,}15 * S^a_{u.x} = 0{,}15 * 9854816{,}0=1478222{,}4 \text{ soums}$$

We calculate social insurance deductions:

$$S_{u.c} = 0{,}4 * (S^a_{u.x} + S^к_{u.x}) = 0{,}4 * 9854816+1478222{,}4=4533215{,}36$$

Now we calculate the average salary of the workers. The average salary is calculated from the following formula:

$$S_{yp} = \frac{S^{a}_{u.x} + S^{\kappa}_{u.x} + S_{u.c}}{N}$$ =9854816+1478222,4+453321,36/11=1442386,7 soums

Now, NU – general expenses are charged at 75% of basic salary, that is:

$$H_y = S^{a}_{u.x} * 0{,}75$$ =9854816*0,75=7391112 soums

Now, we find the total cost of the product:

$$T = S_{м} + S^{a}_{u.x} + S^{\kappa}_{u.x} + S_{u.c} + H_o + H_y + K$$ =1635399160+9854816+1478222,4+4533215,36+7852550+7391112+40483638=1706992713,8 soums

4.4.4. Price, profit and profitability.

We determine the price of one kg of flour as follows:

the cost of one kg of flour

$$T = \frac{T}{N}$$ = 1706992713,8/815000=2094,5 soums

the price of one kg of flour

$B=R_N*T$=1,192*2094,5=2496,6 soums

Product sold:

SM=B*N=2496,6*815000=2034735315 soums

Profit is the main form of material by-product.

F=(B – T) =2496,6-2094,5*815000=327742601 soums

The actual profitability of the output of the enterprise is calculated as follows:

$$R = \frac{\Phi}{T} * 100$$ = 327742601/1706992713,8*100=19,2 %

So, the profitability of the enterprise is 19.2%.

4.4.5. Labor productivity.

Labor productivity is calculated by product:

$$M_y = \frac{CM}{N_a}$$ = 2034735315/11=184975937,7 soums

Labor productivity is also found according to the natural indicator:

$$M_y = \frac{N}{N_a}$$ = 815000/11=74090,9 tn

Capital funds payback period:

$$T_{\kappa on} = \frac{K}{\Phi} \text{=40483638/327742601=0,1 yil}$$

Fund performance:

$$\Phi_c = \frac{CM}{K} = \text{2034735315/40483638=50,3 soums}$$

Table-4.4.

Technical and economic indicators.

№	Indicators	Unit of measure	Value
1	Production volume	tn	815
2	Capital funds	A thousand soums	40483,6
3	Product sold	A thousand soums	2034735,3
4	Number of workers	Person	11
5	Labor productivity		
	a) According to the sold product	thousand soums	184975,9
	b) According to the natural indicator	tn	74090,9
6	Average salary	soum	1442386,7
7	The cost of one kg of flour	soum	2094,5
8	The price of one kg of flour	soum	2496,6
9	Benefit	thousand soums	327742,6
10	Profitability	%	19,2
11	Payback period	year	0,1
12	Fund performance	soum/soum	50,3

Conclusions

- The palatability, quality, caloric content and digestibility of wheat products depend on the chemical composition of its grain. The value of wheat protein is due to the presence of irreplaceable amino acids in it.
- I, III and IV types of soft wheat are used in the production of flour for baking bread, and flour for pasta products is produced from type II wheat.
- Installed and supplied wheat is divided into 6 classes depending on its quality: the highest, 1st, 2nd, 3rd, 4th and 5th classes. The classification is based on the amount, quality, vitreousness, nature, insoluble compounds and the content of germinated grains.
- Wheat proteins contain approximately 20% albumin and globulin, 80% prolamin and glutelin, depending on the weight of all grain proteins. When water is added to it, prolamin (gliadin) and gluten (gluten) form gluten
- The anatomical feature of grain played a significant role in the formation of its technological potential, as well as in the organization and management system of the technological process in mills and grain factories. The ratio of the mass of anatomical parts determines the potential output of products during grain processing.
- In the production of flour and semolina, the outer layers of the grain are separated in the form of by-product bran, feed flour, flakes, and the core of the grain is turned into a finished product.
- In the process of hydrothermal treatment, during the high-quality period, optimal moisture is given to the grain, its value varies from 14.5 to 16.5%, depending on certain parameters of the grain, and determines the best results of its processing.

- It is almost impossible to grind grain into flour with moisture content above 18%. During the processing of dry grain with a density of less than 15%, its shell is easily deformed, crushed and enters it together with endosperm particles, which sharply deteriorates its quality.
- In some cases, low-quality grain (germinated grain, damaged, etc.) is delivered to flour mills, which are used for processing into flour (according to special instructions) or for the production of animal feed.
- The non-uniformity of grain in terms of length, width and thickness prevents the same selection of effective separation, grinding, peeling, hydrothermal treatment processes. In order to ensure high technological results, it is necessary to ensure that the groups of grains accepted for processing are aligned in terms of size.
- To increase the uniformity of the grain groups, the removal of the small grain fraction and sorting of the groups into several fractions are used.
- When assessing the quality of grain, various natural signs that ensure its consumption value are taken into account. When assessing the quality of grain, its appearance, coarseness, size, shape, color, appearance of textures, technical indicators, consumption value are taken into account.
- Amount of grainy, extraneous, separately considered mixtures and fine grain and grain size are determined according to GOST 13586.2-81 standard.
- Grain moisture is the amount of free or bound hygroscopic water expressed as a percentage of the weight of the sample.
- The nature of the grain is determined in PX-1 type one-liter or 20-liter sprays used for export grain categories.
- Amount of gluten and its quality. The methodology of these indicators is determined according to GOST 13586. I-68 and 9404-60.
- The research results show that as the grain size decreases, its surface area and volume also decrease. The outer surface area was the highest in the 1st batch of 73.2 mm2, as it is known that the amount of shell is high and the amount of kernel is less in small grains.

- When we determined the vitreousness of the grains, it was 73% in the 1st batch, 77% in the 2nd batch and 70% in the 3rd batch. Thus, the vitreousness of the researched wheat grains corresponds to the standard requirements for wheat grain intended for flour production.
- When we determined the nature of grains, the nature of grains was equal to 773 g/l in the 1st batch, 768 g/l in the 2nd batch and 765 g/l in the 3rd batch. According to the obtained results, it can be concluded that the set value is high quality grain. These results indicate that it is possible to obtain high-quality and productive flour from the studied wheat batch.
- Thus, the mass of 1000 grains of the studied wheat samples meets the standard requirements for wheat grain intended for flour production.
- According to the obtained results, the grayness index of the grain corresponds to the established norms. The flour quality of the researched wheat samples allows obtaining flour with high quality and output that meets the standard requirements if the technological process is properly designed and managed.
- When we determined the amount and quality of gluten of the researched wheat grains, the highest indicator was found in the 1st batch. The amount and quality of gluten in these wheat grains meet the standard required for weighing flour.
- The analysis of the average data obtained from the grain shows that the grain supplied to Koson DMQQ LLC meets the standard requirements. The enterprise uses different types and subtypes, old and new crops, and good and low-quality grain. The difference in the quality of grain complicates and reduces the process of its processing, requiring correcting the operating modes of technological systems. Ensuring the stable operation of the mill, increasing the production of high-grade flour, improving its quality, and using the existing grain in the enterprise correctly, mixing the grain and grinding batch.
- The quality indicators of flour of the 1st grade in the mill from the naman obtained for the experiment and the dough made from it in the laboratory do not differ from each other. The quality of the dough meets standard requirements.

- It can be seen from the table that the extracted large grain fraction was 71.3% in the 1st batch, 70.6% in the 2nd batch, and 70.9% in the 3rd batch. The large grain fraction of the grain of the studied samples is at the level of requirements and allows obtaining flour with a high yield.
- The yield and quality of the finished product objectively determine the technological properties of the grain. These indicators change significantly under the influence of various factors, i.e. the size of the grain, its completeness, the relative amount of kernel, humidity, and similar factors. The main factors affecting the yield and quality of grain are its size and flattening. Smaller grains have less endosperm and their ashiness increases.
- Research shows that if grain preparation and milling processes are carried out separately by size fractions, the yield of high-grade flour is increased by 8-11%.
- When adding dry wheat gluten, the physical properties of the dough made from weak wheat flour reached the level of strong dough. Adding more than 4% dry wheat gluten does not improve the baking properties of the flour much. Therefore, it is recommended to add 3-4% dry wheat gluten to the baking flour. As a result of the transfer of dry wheat gluten at the rate of 3-4%, it is ensured that the quality of gluten changes from the III-unsatisfactory weak group to the II-unsatisfactory group.
- According to the results of the study, the grain size changed in the range of 23.0-33.1 mm according to the geometric parameters of the grain. The 1st batch was larger. The outer surface area was also higher, 77.7 mm2. Lumki small grain has a high amount of shell and a small amount of kernel.
- When we determine the nature of grains, we determine the nature of grains, the mass of 1000 grains, vitreousness, grain protein, amount and quality of gluten, and the IDK indicator is weakly satisfactory in terms of quality, and the amount and quality of gluten meets the standard required for weighing flour.
- The analysis of the average data obtained from the grain shows that the grain supplied to Koson DMQQ LLC meets the standard requirements. The enterprise

uses different types and subtypes, old and new crops, and good and low-quality grain. The difference in the quality of grain complicates and reduces the process of its processing, requiring correcting the operating modes of technological systems. Ensuring the stable operation of the mill, increasing the production of high-grade flour, improving its quality, and using the existing grain in the enterprise correctly, mixing the grain and grinding batch.

- The amount of kernel in the separated large grain fraction decreased when moving from the large fraction to the small fraction. When the grain size changed from 15 to 30 mm2, the amount of kernel increased significantly. Therefore, the yield of flour from small grains is low, and its quality does not meet high requirements. This small grain fraction is separated in an elevator and used as mixed feed without sending the flour to be weighed.
- When determining the quality indicators of grains divided into fractions, the grain fraction decreased. Similarly, the nature of the grain and the glassiness of the grain were observed to decrease. If the grain preparation and crushing processes are carried out separately by size fractions, the yield of high-grade flour is increased by 8-11%.
- The quality indicators of flour of the 1st grade in the mill from the sample taken for the experiment and the dough made from it in the laboratory do not differ from each other. The quality of the dough meets standard requirements.
- When the economic indicators of flour production are calculated, the cost of 1 kg of flour is 2094.5 soums, the price is 2496.6 soums, the profitability is 19.2%, and the profit is 19.2%. the payback period is 0.1 years, and fund efficiency is 50.3 soum/soum.

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