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ANALYSIS OF METHODS FOR DRYING RICE GROWN IN THE WORLD AND IN THE REPUBLIC OF UZBEKISTAN

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Abstract: According to statistical data, from 2010 to 2022, the area under rice cultivation in the world increased by 2.1%, and global rice consumption increased by 20.9% from 2010 to 2024. Based on the Resolutions of the President of the Republic of Uzbekistan No. PQ-4973 “On measures for the further development of rice cultivation” and No. PQ-290 “On additional measures to support the activities of rice growers”, a sharp increase in the volume of rice cultivation is observed in our Republic from year to year. The sharp increase in the volume of rice cultivation in our republic from year to year leads to an increase in the demand for drying devices based on new energy-saving technologies based on the analysis of drying methods, and the urgency of conducting research in the direction of modernization and creation of such devices.

Keywords words and phrases: temperature, heat, grain, natural, beans, rice, grain, hour, energy, atmosphere.

There are many methods of drying grain, in particular rice, which mainly use two principles: moisture is reduced by removing water from the grain in a liquid state; water is removed from the grain by evaporation.

The first principle uses mechanical and sorption drying methods. The second uses convective, conductive, electrical and radiation (natural) methods.

In the mechanical method of drying grain, water is removed using a centrifuge due to its centrifugal force . Centrifugation is mainly used for grains that are wet from rain. This method is also used when grains are treated with liquid disinfectants.

In the sorption method of grain drying, a sorbent is added to the grain, that is, the sorbent substance absorbs excess water from the grain . Calcium chloride, wood sawdust, silicate gel, and other mixtures can be used as sorbent substances. The main criterion in this method is the ease of separating the additional sorbent substance from the grain. Sometimes wet and dry grains are mixed together. The purpose of this is to ensure a larger distribution of moisture as a result of moisture transfer from one type of grain to another. For example, when dry corn is mixed with wet rice, the following advantages and disadvantages are observed: advantage - the rice is not mechanically damaged; disadvantage - moisture is redistributed for a very long time, about 1-2 weeks. Convective drying of grain uses the convection phenomenon, that is, heat is transferred using forced or natural air movement . Hot air hits the surface of the grain, as a result of which water evaporates from it. Atmospheric air or a mixture of air and gases can be used as a drying agent. The hot air absorbs moisture from the grain surface and removes it to the atmosphere.

Convective drying of grain uses the process of heat transfer through conduction. In this method, the grain is in direct contact with the heat-generating surface, that is, heat is transferred to the grain through the surface. In this method, the grain does not dry evenly, since the lower layer of the grain receives more heat, while the upper layers are heated relatively less.

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Electrical drying of grain uses electric current. In this method, the grain is placed between plates with an electric voltage . When an electric current passes through, the plates heat up and transfer heat to the grain. As a result, the moisture in the grain evaporates and is released into the atmosphere with the help of air. This method provides uniform heating during grain drying. As a result, it is possible to dry the grain evenly, but this method consumes a lot of electricity.

Drying grain by radiation can be natural, in the form of sunlight, or artificial, in the form of infrared lamps. When drying grain naturally in the sun, weather is an important factor, so this method is inconvenient and does not depend on humans. When drying with infrared rays, the grain is heated evenly, but high voltage is required to generate radiation. Therefore, devices operating according to this method consume a lot of energy.

In the republic, 15 varieties of rice are grown, which were included in the “State Register of Agricultural Crops Recommended for Sowing in the Territory of the Republic of Uzbekistan” in 2024, and the rice harvest in 2023 amounted to more than 400 thousand tons. A total of 114 thousand hectares of land are sown with rice in the republic, of which 57.9 thousand hectares are planted as the main crop and 56.1 thousand hectares are planted as a second crop in areas freed from grain. Due to the climatic conditions of our country, most of the harvested crop is dried naturally in the open air . In this method, the following steps are performed to dry the rice, which require a lot of physical effort and time. The rice harvested from the fields with grain combines is spread thinly on asphalted areas for drying (Figure 1.1).



A pile of rice spread out to dry naturally

It should be noted that due to the increasing amount of rice cultivation in our Republic from year to year, due to the lack of paved areas for drying, mainly roadsides are used, which in turn causes some problems. In this method, it is necessary to periodically stir the rice to dry (Figure 1.2).



Figure 1.2. The process of mixing the spread rice for natural drying

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It is known that during cool autumn nights, atmospheric humidity is high. As a result, at night, atmospheric moisture is transferred to rice . For this purpose, it is necessary to collect the spread rice in the evening after the sun has set (Figure 1.3).



Figure 1.3. The state of the spread rice being collected as the sun sets

Rice being dried at night should be covered with polyethylene material to protect it from atmospheric moisture (Figure 1.4).



Figure 1.4. The state of the rice covered with polyethylene material when the sun sets

Drying rice lasts 3-4 days, depending on the temperature of the air and the number of hours of sunshine. Rice grown as a second crop ripens in October and November, depending on the variety and the growing season. By this time, there is a decrease in temperature and an increase in precipitation. As a result, the quality of the rice drying decreases and, accordingly, the yield of rice obtained from the processing of dried rice decreases. In some cases, the lack or absence of small-sized and portable drying equipment leads to the fact that the entire harvest of farmers and peasants becomes unusable. Heat transfer by radiation occurs as follows: under the influence of infrared rays of the sun, the grain layer is heated, moisture evaporates and is released into the atmosphere. The thickness of the rice spread out on the field for drying should not exceed 20 cm. The smaller the layer thickness, the more efficient the drying of the rice. The thickness of the layer of beans and corn grains should not exceed 5-10 cm. The upper surface of the grain layer being dried should have grooves in the direction from

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south to north, which is explained by the fact that the grooves have a higher thermal conductivity than a flat surface. At the same time, there is a difference in vapor pressure of the upper and lower layers, which leads to an increase in the intensity of moisture evaporation. The advantages of this method are that there is no need for electricity, and also that biological processes in the grain do not stop under the influence of ultraviolet rays, and the sterilization process from fungal microorganisms occurs.

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