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Section 9. Mechanics

Astanakulov Komil,
Institute mechanization of agriculture,
PhD of technical sciences, laboratory of harvesting machines
Fozilov Golibjon,
Institute mechanization of agriculture,
scientific employee, laboratory of harvesting machines
Baratov Atkham,
Tashkent State technical University,
assistant, the faculty of mechanics, Uzbekistan
E-mail: komil_uzmei@mail.ru

Researching of machines for early harvesting the cereal crops on small farms

Abstract: In the article the results of the research work are brought on development high-performance new and improving technical facilities for early harvesting the cereal crops on small farms.

Keywords: cereal, mower-machine, thresher, grain-cleaner machine.

At present time deficiency of the food-production is getting one of the global problems in the world. According to information of all over the world's Food Agriculture Organization (FAO) nowadays, shortage of the food-production and possibility to buy it are limited, therefore people more than 840 millions are suffering by famine [1; 7].

This shortage may be prevented by other countries which have big possibility to produce agricultural productions and also there is big possibility to produce agricultural production in Uzbekistan.

If there is no water deficiency, it may be got crops 2–3 times from one land area in a year. At present there are two types of the farms in Uzbekistan, they are peasant farmers and large farmers, peasants farmers' area is between 0.1 and 0.5 hectare, large farmers' area is from 10 hectare till about 100 hectare [2, 34; 3, 36].

Last time, on peasant and farmer's farm it is organizing to get crop 2–3 times, they are cereal and after it repeatedly corn, potato, vegetable, melon-watermelon and another crops. For getting sterling and high crops from repeatedly plants, it is connected with to seed them earlier and faster after cereal.

Therefore, we analyzed different type of the harvesting methods, in Uzbekistan cereal plants are harvested their wax

ripe period on peasant farms which have 0.1–0.5 hectare, then crops are dried on the stationary area, and we found optimal of this method.

By this method cereal is harvested when its moisture is 35–38 % and no more cereal mass (1.0–2.0 t.) is transported out of the field, and it is stacked, dried. While drying 7–8 days grain's moisture decreases by 17–18 % and it is ripened. The dried cereal is threshed and grain is cleaned. This method gives possibility to seed for repeatedly plants 8–10 days earlier [4, 132–134].

Until recently time harvesting of cereal has been done by hand labour, threshing it has been done by combine harvester, and cleaning grain has been done by big grain cleaner machines. As a result labour expense, energy and exploitation expenses are high.

Therefore, we chose self propelled vertical conveyor reaper, for threshing the mowed cereal and cleaning their grain we created small size thresher and grain cleaner machines.

Reaper's cutting width is 1.5 m, it has double knife cutting mechanism and they cut and lays the cereal's stalks. In the experiment optimal work speed was researched. When work speed was increased from 0.6 up to 1.2 m/s it was known that grain lossless increased from 0.08 % up to 0.42 % (table 1).

Table 1. – Influence to work quality indicators of the speed of mower machine

No.	Indicator's names	Moving speed of the mover machine, m/s						
		0.6	0.7	0.8	0.9	1.0	1.1	1.2
1	Grain lossless, %	0.08	0.08	0.12	0.14	0.18	0.26	0.42
2	Stalks' laying angle, degree	2	3	3	5	8	9	12
3	Cutting height's avoiding, %	4	7	11	15	18	23	31

Besides this, when reaper's speed was 0.6–1.2 m/s grain lossless didn't increase of 0.5 % and it was sterling, work-quality indicators were nice when reaper's speed was 0.6–1.1 m/s for stalk's laying angle.

When speed was 1.2 m/s the defined demand increased from 10°. When cutting height's avoiding was defined by reaper's 0.6, 0.7, 0.8, 0.9, 1.0, 1.1 and 1.2 m/s work speed this indicator was 0.6–1.0 m/s work speed, it increased from 4 % up to 18 %, and didn't increase defined demands (20 %).

However, after work speed increase from 1.0 m/s avoid of the cutting height was worse, and it was known increasing

from 20 percent. Besides when it was high speed from 1.0 m/s work speed, worker had to walk faster to manage the reaper.

Therefore, it was known that increasing its load.

So, if reaper's work speed is not increased from 1.0 m/s, its work-quality will be at the level of the demand.

The created thresher's length is 1700 mm., its width is 1350 mm., height is 1000 mm., and its mass is 520 kg.

When this thresher was tested for threshing wheat its threshing efficiency was 99.7 %, for barley threshing efficiency was 99.6 % (table 2).

Table 2. – Testing results of the thresher

No.	Indicator's names	Indicator's quantity		
		According to preliminary demands and technical task	According to results of the test	
			By wheat	By barley
1	Threshing efficiency, %	at least 98	99.7	99.6
2	Breaking and damaging of the grain, %	the most 2	0.6	0.4
3	Cleaning efficiency of the threshed grain, %	at least 95	96.2	96.7
4	Lossless of the grain, %	the most 2	0.7	0.8
5	Choping degree of the straw, %	at least 70	98.7	98.2

Cleaning efficiency of the threshed grain was 95.4–98.2 %, damage of the grain was between 0.4–0.6 %. Lossless of the wheat grain was average 0.7 %, and barley grain was 0.8 %, and it contented full the defined demands.

While testing output capacity of the thresher, it was defined that cereal mass was 710–800 kg/hour, expense of energy was 2.7 kWt. Also, straw's choping level which comes in from thresher was quality and it was known that it is not important to chop additional the straw to give for cattle.

As a result of the done researches, small grain-cleaner machine was created which has smooth surface sieve and it is

adapted to primarily clean grain. Length of the grain cleaner machine is 1500 mm., its wide is 800 mm., height is 1100 mm., and mass 305 kg.

When machine was tested to clean grain from major mixture was 99.8 percent, to clean from small mixture was 98.7 and grain cleanliness was average 99.2 percent (table 2). Other grass seed which is grain component was separated 62.1 percent and total grain lossless was 0.6 percent. Output capacity of the machine is 717.1 kg during the main work time, it is 508.3 kg during exploitation time, expenses of energy is 1.8 kWt.

Table 3. – Testing results of the grain-cleaner machine

No.	Indicator's names	Indicator's quantity	
		According to preliminary demands	According to test
1.	Cleaning the grain from major mixture, %	at least 99	99.8
2.	Cleaning the grain from small mixture, %	at least 98	98.7
3.	Cleaning from other grasses' seed, %	at least 60	62.1
4.	Total grain lossless, %	the most 3	0.6

According to the done tests, sieve was given with together frontal swing 3–5 mm. across swing and it was defined that there is possibility to decrease of grain lossless to 20–25 percent than before and there is possibility to improve 1.1–1.2 times the grain cleanliness.

In general, machines which are recommending give possibility to harvest of cereal 8–9 days early than usual, mowing process by hand labour is mechanized on small farms, expenses during the process for threshing and grain cleaning are decreased and labour expenses are decreased 2–3 times.

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