Environment & Ecology 29 (3A) : 1250—1252, 2011
 ISSN 0970-0420

Performance Study of Power Operated Winnower by Farm Women in North Eastern Coastal Plain Zone of Orissa

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Abstract

The study was undertaken to assess the working capability of farm women in using a power operated winnower and to evaluate the output capacity of the machine as compared to the traditional method of winnowing. The winnowing methods were manual winnowing by traditional method and power operated winnower. The experiment was conducted with paddy variety Parijata having moisture content 12.5% (db) with different feed rates and air velocities. The output of winnower per hour was observed to be 52 and 910 kg for traditional winnowing method and power operated winnower respectively by the farm women. However, the output capacity of the same winnower used by the man laborer was found to be 930 kg/hour. Similarly the net winnowing cost of paddy with the power-operated winnower by farm women was calculated to be Rs 0.03/kg of paddy compared to Rs 0.84 for traditional method. Looking into the working capability of farm women at par with the farm laborer, the cost effectiveness and better performance of the power operated winnower, the unit needs to be popularized and demonstrated among the farm-women in the state Orissa.

Key words : Performance, Power operated winnower, Farm women.

Human energy from farm women in general is the important source of farm power in crop production operations as women power is utilized in operating many of the small implements and tools for various operations in agriculture. Farm women at present are also gradually involving themselves in stationary power operated machines for chaff cutting, cane crushing, winnowing and many other such activities with a view to divert their male members to other profitable business for raising their economic conditions. Also there is the requirement of women power particularly in the peak seasons of agricultural operations like transplanting, weeding / interculture, pesticide applications, harvesting, threshing and post harvesting operations. Hence, the women power is at present contributing a major source of farm power in today's energy requirements in agriculture. As paddy is an important crop in the cropping pattern of Orissa, the involvement of women in different operations for growing paddy needs to be encouraged for enhancing the availability of power in crop production. The production of paddy in the state has been increased substantially (1) due to the introduction of high yielding varieties and adoption of scientific methods in agricultural practices by the farmers. As paddy is grown three times a year in the major parts of the state and due to increase in yield, winnowing operation consumes more time and labor for getting better quality and of clean seeds. Moreover, the farmers don't get more time to spare in winnowing operation for involving themselves in the land preparation work of next crop cultivation. This necessitates the mechanization and involvement of women in winnowing operations to reduce time of operation, grain losses and to increase the purity and output of the grain. In Orissa, though mechanization of agriculture has gained certain momentum, the farmers still follow traditional method of winnowing with the help of "Kula" (a basket like structure with one side open and made of bamboo), which involves more labor, time and cost. These operations are carried out in open threshing and are often threatened by unfavorable weather conditions. Hence considering the need and cost effectiveness of winnowing operation, a power operated

Table 1. Specification details of developed power operated winnower.

	Particulars	Details
1	Type of machine	Power operated, with air blower, feed roller, oscillating tray, feed hopper
2	Manufacturing organization	Govt. Implement Factory, Orissa
3	Overall dimensions	Length 1520 mm ; Width 725 mm ; Height 1365 mm
4	Weight	300 kg
5	Prime mover	1 hp electric motor
6	Power transmission system	V pulley, belt and gear-pinion arrangement
7	Air blower	One, straight blade, air-regulating gate in casing of blower, RPM-1400
8	Number of blades of blower	Four
9	Feed roller	Rotary and number-one
10	RPM of feed roller	50
11	Number of oscillating conveying tray	One
12	Feed hopper	Manually, capacity 0.07 m^3, feed rate 1050 kg/hour
13	Sieve	Fixed gap type
14	Transport	Manually transported with 4 nos. of wheel

winnower having more output capacity needs to be popularized in the farming community through women power for its economic viability and working feasibility as compared to the existing traditional winnowing method in the coastal regions of Orissa.

Methods

The testing of the above mentioned winnowing method was conducted at Krishi Vigyan Kendra, Baliapal, Orissa with the paddy variety Parijata having moisture content 12.5% (db) and foreign material content to be about 20%. In the winnowing methods, the winnowing operation was continued during 5 minutes interval. After 5 minutes, the total weight of material, collected at main gain outlet was measured. Samples of 2 kg material from main grain out let and 0.5 kg from chaff outlet were collected for analysis. The instruments like tachometer, anemometer, wattmeter, stopwatch and weighing balance were used to record the test data.

Table 2. Comparative test results of different winnowing methods. T_1= Power operated winnower, T_2 = Manual winnowing by traditional method.

	Parameters	Treatments T_1	T_2
1	Crop and variety	Paddy Parijata	Paddy Parijata
2	Crop length (cm)	99	99.3
3	Moisture content of grain (%)	12.5	13.1
4	Moisture content of straw (%)	9.2	9.6
5	Percentage of foreign matter in mixture before feeding (%)	20	19.3
6	Grain-crop ratio	0.25	0.26
7	Feed rate kg/hour	950	48
8	Wind velocity of blower/ winnowing system m/s	5.4	2.01
9	Farm women labor requirement (no.)	2	4
10	Man labor requirement (no.)	2	3
11	Grain Purity (%)	96	95.03
12	Grain recovery (%)	97.8	92.86
13	Cleaning efficiency (%)	94	95.31
14	Winnowing index	0.93	0.85
15	Output capacity (kg/hour) women labor	910	52
16	Output capacity (kg/hour) man labor	930	56
17	Cost of winnowing Rs/kg) women labor	0.03	0.84

Power Operated Winnower

The power-operated winnower mainly consisted of the following parts : Feed hopper, feed roller, oscillating conveying tray, air blower, 1 hp electric motor, power transmission system, the specifications of this winnower is in (Table 1).

The grain containing foreign material is feed through hopper and the grain with foreign material falls on the feed roller which helps in smooth and uniform feeding and to induce proper pattern of fall of grain mixture. Then, the grain containing foreign material falls on the conveying tray, which is being vibrated with a cam and connecting rod. Thus the grain and chaff stream keeps on falling in the upward inclined air stream from the air blower, which blows off the chaff through the chaff outlet and the clean grain keeps on falling through grain outlet. The main design involved in this machine is the use of air stream

by directing the air blower upwards at an angle of 36^0 to the horizontal for better separation of grains and chaff. The air blower is also designed for producing air velocity less than the terminal velocity of grain. There is an adjustable air-regulating gate in the casing of the blower for adjusting the air velocity required for winnowing of a particular type of grain.

The performance of the power operated winnower was done and compared with the traditional winnowing method as per ISI Test Code No. IS : 8440-1977 Indian Test Code for paddy winnowing (2). The economics of the use of this machine was also compared with the traditional method as per the following treatments.

Results and Discussion

The results of the experiments conducted for the two winnowing methods have been discussed for the paddy variety Parijata having grain crop ratio found to be about 0.24 for the treatment T_1 and T_2 (Table 2).

The performance of the power operated winnower was found to be highly satisfactory as compared to the traditional methods of winnowing to grain purity percent, grain recovery percent and winnowing index, and with the lowest cost of operation i.e., Rs 0.03 per kg of paddy. Considering the performance, cost of operation by the farm women, benefits in the case of operation, timeliness in operation, reduction in drudgery and purity of winnowed paddy, this power operated winnower needs to be popularized and demonstrated among the farm women in the state of Orissa.

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