



## Assessment of Hanging Type Grain Cleaner Drudgery Reducing Tool by Farm Women

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### ABSTRACT

The study was undertaken to assess ergonomically efficiency of hanging type wheat grain cleaner, carried out in adopted villages under On Farm Testing (OFT) and Front Line Demonstration (FLD) program conducted by KVK, Mandsaur (M.P.). Total Fifteen farm women were selected to assess the physiological workload to compare the impact of improved technology over conventional practice for hanging type grain cleaner. Physiological parameters i.e. HR, energy expenditure, cardiac cost reduction and physiological cost reduction etc., were measured during operations. The results revealed that hanging type grain cleaner has proved proficient on time and output parameters. The average cardiac cost of work was decreased by 82.29 per cent while using hanging type grain cleaner for wheat. Drudgery reduction was found 83.96 per cent and it saved time by 89.10 per cent when compared to traditional practice. The physiological cost of work and energy expenditure in terms of heart rate were observed to be lower while performing activities with hanging type grain cleaner as compared to the traditional practice.

### INTRODUCTION

Agriculture is a primarily unorganized sector in which farm women perform the majority of drudgery prone works. The women farmers do the agricultural task with the age old traditional tools which are unsafe, hazardous, unhealthy and long hours of work which often accelerate health related problems among them. Women work force engaged in agriculture and allied activities is estimated around 92 million which constitute about 40 percent of the total rural workers in the country (Singh et al., 2007). The involvement of village women for agricultural work is well known. Farm women thus lead a very hard life. (Hasalkar et al., 2005). It was observed that more than 75 per cent women are involved in activities like winnowing, weeding, grading, threshing and cleaning of field farm operations (Singh & Vinay, 2013). Generally heart rate is used as an ergonomic measure to evaluate the physiological or functional demands of work on the individual workers (Hasalkar et al., 2004). The physiological point of view, the job demand or work load refers to the demands placed on the cardio-respiratory system and is

determined by the energy cost and cardiac cost of work (Chauhan, 1999). Keeping the above mentioned fact in mind, this study was planned to assess the physiological workload and working efficiency of farm women through hanging type grain cleaner for wheat.

### METHODOLOGY

The present study was carried out on farm women in adopted villages Sejpuriya and Kolwa under On Farm Testing (OFT) and Front line Demonstration (FLD) program conducted by KVK, Mandsaur (M.P.). To assess physiological workload compare with improved technology over conventional practice for hanging type cleaner. Fifteen farm women subjects in the age group of 24-45 years without having any physical deformity, were selected because they usually attain their highest strength level between 20-45 years (Mc Ardle et al., 2001) Study was carried out with improved hanging type grain cleaner technology. It consists of main frame, grading screen, draper rod, rubber grip over handle, shutter etc. Four ropes are tied on the hooks provided on main frame of cleaner and hanged on any elevated point or hooks attached to the ceiling. It is

taken out in a bag that is hanged on a sack holder by opening shutter of cleaner, capacity of 225 kg/h made by CIAE, Bhopal whereas traditional manual sieves (Chhanna) were used cleaning the wheat in farmers practice. Well prepared interview questionnaire was carried out for collecting the data. The anthropometry and weighing balance were used to measure the physical characteristics like height and weight. The grading of health status of women was done on the basis of Body Mass Index. The BMI scores were interpreted as per the classification given by Garrow (1987). During the experiment various parameters viz., time profile, cleaning efficiency were recorded by using Stop watch for recording the time determined for the farm women. The physiological stress parameters were studied by using the heart rate monitor sphygmomanometer (Digital), based on the heart rate records, the following parameters were calculated. For calculation of Energy Expenditure Rate for heart rate, Singh et al., (2008) The cardiac cost of work is the total number of heart beats spent about the resting level in order to perform the work. The cardiac cost of recovery is the total number of heart beats above the resting level occurring at the end of work and return to the pre activity state (Saha, 1976). The results were statistically analyzed using method proposed by Snedecor & Cochran (1989).

1. Average heart rate during rest and work. Measured by (Digital) sphygmomanometer.
2. The energy expenditure per minute was estimated from the heart rate with the help of formula Energy expenditure (kJ/min) = (0.014 x WHR – 0.68) 20.93
3.  $\Delta\text{HR}$  (beats/min) = Average working heart rate – Average heart rate during rest
4. Output (kg/h) = Cleaning yield of wheat grain kg / average time
5. Physiological cost reduction (%) =  $T^1 (\Delta\text{HR}/\text{Output}) - T^2 (\Delta\text{HR}/\text{Output}) \times 100/T^1$
6. Cardiac cost reduction (%) =  $(\text{CCWT}^1 - \text{CCWT}^2) \times 100/\text{CCWT}^1$

## RESULTS AND DISCUSSION

It is depicted from Table 1 Physical characteristics of the respondent's basic anthropometric data of ergonomic point of view, average age was found  $37.73 \pm 6.18$  years, height  $157.40 \pm 4.50$  cm and weight  $53.46 \pm 4.34$  kg respectively. The mean Body Mass Index (BMI) was calculated using standard formula weight in Kilograms / (Height in Meters)<sup>2</sup> it was  $21.57 \pm 1.33$  which meant that they were in the normal category. Physiological stress for cleaner hanging type sieve for wheat was determined on the basis of various parameters like average heart rate during work and rest, energy expenditure and physiological cost of work while performing the cleaning activity. It is clear from Table 2. Output work recorded for cleaning saved time of farm women with the work capacity of  $191.33 \pm 13.29$  kg hour<sup>-1</sup> against  $20.73 \pm 2.28$  kg hour<sup>-1</sup> in local practices. The average working heart rate observed in traditional sieve and hanging type grain cleaner was  $93.27 \pm 5.54$  beats/min and  $107.40 \pm 4.60$  beats/min, respectively. Average  $\Delta\text{HR}$  was  $36.40 \pm 2.69$  beats/ min. while by cleaner hanging type sieve it was recorded as compare to traditional sieve  $22.27 \pm 4.43$  beats/ min. Our results also confirm to (Badigar et al., 2006; Vishwakarma et al., 2015; Bajpai et al., 2016; Ohja & Singh, 2019). The cardiac

**Table 1.** Physical characteristics of selected respondent

Physical characteristics	Mean±S.D. (N=15)
Age (yrs)	37.73±6.18
Weight (kg)	53.46±4.34
Height (cm)	157.40±4.50
BMI	21.57±1.33

**Table 2.** Ergonomic evaluation data of different parameters hanging type sieve for wheat

Particulars	Mean±S.D. (N=15)	
	(Traditional Sieve)	(Cleaner hanging type Sieve)
No of Workers required	01	02
Output (kg/h)	20.73±2.28	191.33±13.29
Energy expenditure (kJ/min)	13.10±1.62	17.24±1.35
WHR (beat/min)	93.27±5.54	107.40±4.60
$\Delta\text{HR}$ (beats/min)	22.27±4.43	36.40±2.69
CCW (beats/kg)	64.91±13.68	11.49±1.39
Labour required (Man/h/qt.)	4.88±0.52	0.53±0.04
Cardiac cost reduction (%)	NA	82.29
Increase in work efficiency (%)	NA	416.93
Time Saving (%)	NA	89.10
Physiological cost reduction (%)	NA	83.96

cost of worker was  $64.91 \pm 13.68$  beats/kg while using traditional sieve (Chhanna) where as  $11.49 \pm 1.39$  beats/kg in cleaner hanging type Sieve. It saves 82.29 per cent cardiac cost of reduction per unit of output work. The average heart rate difference between working ( $\Delta\text{HR}$ ) was found more variant by using Cleaner hanging type Sieve. It is accountable for energy expenditure during cleaning by cleaner hanging type sieve and calculated energy expenditure  $13.10 \pm 1.62$ kJ/min. traditional practices, while by improved practice it was recorded as  $17.24 \pm 1.35$ kJ/ min. with increase in work efficiency 416.93 per cent respectively. Physiological cost reduction was calculated 83.96 per cent as compared to traditional practice. It also saves time by 89.10 per cent as compared to traditional practice. Manpower Labour engaged for cleaning also minimized  $0.53 \pm 0.040$  (Man/h/qt.) in improved method. Whereas in traditional method  $4.88 \pm 0.52$  (Man/h/qt.) respectively. Raina et al., (2021) reported increased labour work output per unit time by reducing efforts, drudgery and improved quality of farm operations. The physiological difference was also observed by many research workers (Singh et al., 2010; Singh, 2013; Bajpai et al., 2016; Sharma et al., 2018) during various agricultural operations. Tripathi et al., (2020) also reported user Eco-friendly tools can increase the working efficiency and reduce the working load health hazards during agricultural activities on farm (Kumari et al., 2019) reported that promotion of technology in gender perspective towards the challenges of farm women would help in reducing drudgery and occupational health hazards of women workers in agriculture.

## CONCLUSION

From this investigation it has been concluded that in hanging type cleaner used by farm women decreases the cardiac cost and increases the efficiency of output work as compared to traditional practice for wheat cleaning. It saves time and minimizes the labour engagement tool is Eco-friendly, which helps to reduce the

environmental and occupational health hazards during farm activity. Hence, the agricultural workers involved in cleaning wheat suggested working with improved hanging type cleaner to lessen work related to physiological workload.

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