



## ERGONOMIC EVALUATION OF HAND OPERATED MAIZE SHELLER ON FARM WOMEN OF MANDSAUR DISTRICT (M. P.), INDIA

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### Abstract

Women in India play a significant and crucial role in agricultural development and allied fields. It is most unfortunate that the role of women in agriculture has not yet highlighted in India. 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. Various studies on women in agriculture point to the fact that women are generally employed in the operations, which are either not mechanized or least mechanized and involve a lot of drudgery. Hence, a study was conducted in Mandasaur district (M.P.) to minimize the drudgery of farm women in maize shelling. The results show that the hexagonal tubular maize sheller saves almost half the time and increases working efficiency 79.24 per cent and reduces 87.94 per cent drudgery of farm women over traditional practice. The cleaning efficiency was also found to increase 6.6 %. Hence, Maize Sheller is best option for the women it saves not only the time, but increases the efficiency of farm women twicely.

**Key words :** Maize Sheller, Ergonomic Evaluation, shelling efficiency, cardiac cost of work.

### Introduction

Women play a vital role in agricultural development resources. 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. Various studies on women in agriculture point to the fact that women are generally employed in the operations, which are either not mechanized or least mechanized and involve a lot of drudgery (Singh *et al.*, 2007).

The nature and extent of participation of farm women in agricultural activities are affected by a host of factors, which include, regional variations in nature of work, socio-economic status of the farm families, family traditions, change in nature of activities due to mechanization, introduction of time and labour saving implements and variations in agro-climatic conditions (Gautam *et al.*, 2008). Women working in the field in post harvest activities and in commercial agriculture have to live a life full of drudgery, where they are constantly engaged in monotonous, repetitive tasks that involve harmful postures, wet conditions and handling toxic materials. Even in post harvest work, women carry out the operations manually

in an arduous manner when technologies are now available for threshing, winnowing and milling as also for shelling of maize cob and groundnuts. However, improved tools and equipments need better skills and training. Since, women are usually preoccupied with home management activities such as procuring fuel, fodder etc. they are hardly able to spare time to improve their skills. Farm women accomplish shelling of maize cob manually through finger nail, sickle or beating of cob by wooden sticks. Women perform this activity in banding and squatting posture for longer time. This posture increases the fatigue and drudgery of farm women. This research is aimed to reduce their drudgery and increase their working efficiency and work quality by introducing hexagonal hand operated tubular maize Sheller. 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). From 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).

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## Materials and Methods

The maize shelling activity study was carried out on farm women in adopted village Udpura under K.V.K., Mandsaur (M.P.), India. Farm women are aged between 25-45 years without having any physical deformity. During the experiment various parameters *viz.*, time profile and physiological stress were studied. Comparative study was carried out with improved technology (Hexagonal maize Sheller) approximately 100 cobs were taken for both the treatments *i.e.* hand shelling and tubular maize sheller for assessing the drudgery involved in Shelling of maize. Well prepared interview performa was carried out for collecting the data. While assessing the data especial attention was given to the selected sample size as regards to their physical fitness and prevalence of any serious health hazard. The anthropometric rod 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 BMI. The BMI scores were interpreted as per the classification given by Garrow (1987). Stop watch was used for recording the time for determined for shelling of 100 maize cobs by farm women. The heart rate was recorded by using the heart rate monitor sphygmomanometer (Digital), based on the heart rate records, the following parameters were calculated.

\* Average heart rate during rest and work.

\* The energy expenditure per minute was estimated from the heart rate with the help of formula Energy expenditure (kj/min) =  $(0.0114 \times \text{WHR} - 0.68) 20.93$

\*  $\Delta\text{HR}$  (beats/min) = Average working heart rate – average heart rate during rest.

\* Output (kg/hr) = weight of maize cob  $\times$  duration / average time.

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

Physical characteristics	Mean $\pm$ S.D.
Age (yrs)	29.00 $\pm$ 9.77
Weight (kg)	50.20 $\pm$ 3.96
Height (cm)	149.20 $\pm$ 4.26
BMI	22.56 $\pm$ 1.79

## Results and Discussion

### Physical characteristics of the respondents:

Basic anthropometric data of the subjects have been presented in table 1. As shown in the shelling through ergonomic point of view, respondents in the age group of 25 to 45 years were selected at random and average age was counted as 29.00 years. The basic body dimensions were measured an average was worked out as height (149.20 cm) and weight (50.20 kg), respectively. The mean body mass index (BMI) was calculated to be 22.56 which meant that they were in the normal category. Physiological stress of the maize sheller 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 activity. Table 2 revealed that hand shelling required 63.6 minutes to shell the maize while maize sheller required only 34.2 minutes. So, it is clear from the table that maize sheller saves more than half the time against the hand shelling and increases twice of working efficiency as the output recorded by tubular maize sheller was 19 kg/hr as compared to hand shelling by which only 10.60 kg/hr maize was shelled. During hand shelling, the average  $\Delta\text{HR}$  was 14.80 beat/ min. while by maize Sheller, it was recorded as 3.2 beats/min. The cardiac cost of worker was 83.88 beats/kg during manual shelling while 10.10 beats/ kg by maize seller. So, the maize sheller saves 87.94 per cent

**Table 2 :** Ergonomic evaluation data of different parameters during maize shelling.

Particulars	Mean $\pm$ S.D.	
	(Traditional Method)	(Tubular maize sheller)
No. workers required	1	1
Time spent to shell 100 cobs (min.)*	63.6 $\pm$ 3.04	34.2 $\pm$ 1.92
Output (Kg/hr)	10.60 $\pm$ 0.29	19.00 $\pm$ 0.77
Energy expenditure (kj/min)	6.06 $\pm$ 0.64	3.13 $\pm$ 0.54
WHR (beat/min)	84.40 $\pm$ 3.28	72.80 $\pm$ 2.28
$\Delta\text{HR}$ (beats/min)	14.80 $\pm$ 1.30	3.2 $\pm$ 0.83
CCW (beats/kg.)	83.88 $\pm$ 8.25	10.10 $\pm$ 2.77
Labour required (Man/hr/qt.)	9.43 $\pm$ 0.25	5.26 $\pm$ 0.21
Cleaning efficiency (%)	93.4 $\pm$ 0.54	100 $\pm$ 0.0
Reduction in drudgery (%)	-	87.94
Increase in efficiency (%)	-	79.24
Time Saving (%)	-	44.22

cardiac cost of worker per unit of output. The average heart rate difference between working ( $\Delta$ HR) were found more variant by using tubular maize sheller, it is an accountable for energy expenditure during the course of shelling by maize sheller and calculated energy expenditure 6.06 kj/min. traditional practices, while by improved maize sheller, it was recorded as 3.13 kj/min. and increases efficiency 79.24%. The physiological difference was also observed by many research workers (Singh and Gite, 2007; Singh *et al.*, 2010) during various agricultural operations.

### Conclusion

The results shows that the hexagonal tubular maize Sheller saves almost half the time and increases working efficiency 79.24 per cent and reduces 87.94 per cent drudgery of farm women over traditional practice. The cleaning efficiency was also found to increase 6.6%. Comparison with traditional method, Hexagonal tubular maize sheller shows easy in operation no muscle strain, low cardiac cost, less energy expenditure while using traditional practice. Hence, maize sheller is best option for the women, it saves not only the time but increases the efficiency of farm women twice.

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