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Drudgery reduction in farm women for increasing their efficiency with Groundnut decorticator and Hand wheel hoe one lane weeder in groundnut crop

Preeti Verma, DV Singh and Naresh Kumar Agrawal

Abstract
This research was aimed at to reduce drudgery in farm women during Groundnut cultivation. Groundnut decorticator for groundnut dehulling and hand wheel hoe one lane weeder for weeding in groundnut crop were demonstrated in the villages of Tonk district by Krishi Vigyan Kendra, Banasthali Vidyapith. The research results showed that both the time and energy of farm women performing selective agriculture task in Groundnut cultivation were found to be lower as compared to the traditional methods that involved dehulling of groundnut by mouth and hands and weeding by *Kudali*. The farm women experienced that dehulling and weeding of groundnut crop with enhanced tools became easy in comparison to traditional methods**.** Total drudgery index of farm women was also reduced in comparison to traditional methods.

Keywords: Groundnut, drudgery, farm women, groundnut decorticator, cono weeder

Introduction
Women have very important role in agriculture from seed sowing to its harvesting. Women have seventy percent of share in major farm work (NSWF, 2014). All the farm activities are done by farm women manually with prolonged work hours and posture that adversely affect women's health.

In India, the groundnut is grown in an area of around 85 lakh hectares. Before sowing of groundnut, dehulling of groundnut is a very tedious and tiring job of farm women. In manual dehulling of groundnut, farm women have to dehull groundnut by hand or by mouth. In this activity, farm women face a problem of mouth lesions and pain in hands and back. Once groundnut is sown in the field, its weeding again requires lots of hard work. In manual weeding of groundnut, farm women have to bend for a longer period of time. This leads to a serious problem in farm women's health. Mostly weeding of Groundnut is done with *Kudali* by farm women. This method of weeding takes lot of long time and leads to drudgery. Bending at a stretch also leads to physical load which causes muscular pain and efficiency of farm women also decreases. An icing on the cake is that during peak hours this problem becomes critical when other man power is not available.

Thus it is very important that farm women must have some economic and man power saving equipments. So, this study is based on the demonstrations done by Krishi Vigyan Kendra, Banasthali Vidyapith in introducing a Groundnut Decorticator and Hand Wheel Hoe One Lane Weeder, a drudgery reducing equipments. Both are important equipments in groundnut cultivation for increasing efficiency and reducing drudgery. The research was designed with following objectives:

- To demonstrate Groundnut decorticator over traditional dehulling method
- To demonstrate Hand Wheel Hoe One Lane Weeder over traditional weeding method
- To assess output, manpower requirement and energy requirement in farm women
- To estimate drudgery index in farm women

Materials and Methods
Selection criteria of farm women
Thirty farm women were selected from three villages Sangrampura, Damodarpura and Motipura of Tonk district, Rajasthan. In the inclusion criteria, Farm women had good experience of groundnut dehulling by hands and manual weeding of groundnut crop with *Kudali.* They were all healthy and with no disease.

Anthropometric parameters of farm women were assessed. BMI (Body Mass Index) of farm women was calculated from the formula weight (kg)/Height (Meter^2) and classified it on the basis of WHO standards.

Description of groundnut decorticator and Hand Wheel Hoe one lane Weeder

For groundnut dehulling, Groundnut Decorticator was used which was developed by Tamil Nadu Agricultural University, Coimbatore with characteristics of Manually operated, Groundnut Decortication Efficiency- 25-30 kg/hour, Length-2 feet, width-1 feet, weight- 30 Kg. Groundnut decorticator is most suitable of medium sized groundnut pod. For weeding in groundnut crops, Hand Wheel Hoe one lane Weeder was used which was developed by Central Institute for Women in Agriculture, Bhubaneswar. It works in the soil up to a depth of 5 cm in crop in groundnut, wheat and seasonal vegetables. Its length can be adjusted according to the height of the worker.

Demonstration of groundnut decorticator and Hand Wheel Hoe one lane weeder

Groundnut decorticator was demonstrated before sowing of Groundnut crop as the basis requirement is its dehulling. The demonstration was conducted at different time intervals of the day from nine AM to five PM. Dehulling by hands was also performed by farm women to find the difference with above demonstrated technology. When the crop was sown in the field, its weeding was the tedious task to be performed. Hand Wheel Hoe one lane Weeder was demonstrated for weeding in groundnut crop. First Weeding in groundnut
as performed at 20-25 days of sowing and second Weeding was done at 35-40 days of sowing at different time intervals of the day from nine AM to five PM. To check the difference, weeding with *Kudali* was also performed by the farm women.

Output, Man power and physiological workload

Output, Manpower required and physiological workload in farm women are the important parameters to assess efficiency of the equipments. Output of groundnut decorticator was assessed as dehulling in kg per hour while in weeding it was assessed as weeding in square meters per hour. Total manpower, time and drudgery index were assessed in both demonstrations in comparison to their traditional methods. Average heart rate of farm women during work and rest were assessed. On the basis of average heart rate at work and rest, physiological load was assessed and classified on the basis of classification given by Varghese, 1994 [7] (Table 1).

Table 1: Classification of Workload

Physical work load	Physiological variables	
	Energy expenditure (KJ/Min)	Heart beats (Beats/min)
Very light	< 5.0	< 90
Light	5.0-7.5	91-105
Moderate	7.6-10.0	106-120
Heavy	10.0-12.5	121-135
Very heavy	12.6-15.0	136-150
Extremely heavy	>15.0	> 151

Varghese (1994) [7].

Estimating drudgery index

Drudgery index is used to estimate drudgery level in farm women. There were certain rating scales that has been used to estimate drudgery index. These rating scales were based on physical/Manual load, Pastural discomfort and pain in body parts, repetitive work, physiologically stressful work, work demanding more time at task and work causing musculo skeletal disorder and pain. Each parameters of rating for drudgery estimation are given below:

- **Ratings on the basis of manual loads:** Manual handling of loads includes the load exerted on body muscles to push, lift and carry the material. It also leads to a perception among women that work is heavy and demands muscular potential. Rating on manual loads operative: No loads-(1), Light loads-(2), Moderately heavy loads-(3), Heavy loads-(4), Very heavy loads-(5)
- **Rating on the basis of postural discomfort:** Improper body postures causes discomfort and stress on skeletal and joints. Sitting on feet, bending and stooping are the common postures adopted by farm women performing agriculture tasks. Such working postures result in pains, body disorders, hazards, and low output efficiency. Ratings on postural discomfort related pain**:** No pain-(1), Mild pain-(2), Moderately painful-(3), Painful-(4), Very painful-(5)
- **Ratings on the basis of repetitive work:** Repetitive work refers to the work that are performed with the same operation again and again. Such type of work needs same amount of strength or physical action and operations with similar length. Ratings on repetitive work: Repetitive less than 10 per cent of time-(1), Repetitive work 10-29%-(2), Repetitive work 30-49%-(3), Repetitive work 50-79%-(4), Repetitive work greater than 80%-(5)
- **Ratings on the basis of physical stress:** when work needs forceful and rapid muscular movements, it exert physical stress. Headache, muscle tension and fatigue are the main symptoms under this stress. Ratings on physical stress: Very Light/ no exhaustion-(1), Light/mild exhaustion-(2), Moderately heavy/exhausting-(3), Heavy/exhausting-(4), Very heavy/very exhausting-(5)
- **Ratings on the basis of work demands more Time:** Based on the time spent on task, time loads are perceived as Very less duration-(1) less duration-(2), moderate duration-(3), high duration-(4), Very high duration tasks-(5). In this eight hour/day is taken as high duration to consider the time load.
- **Ratings on the basis of Work causing Musculo skeletal disorders and pain**: Prevalence of musculo skeletal disorders due to work situations, exposure to risk factors, incompatible postures, constrain workers and effect their output efficiency. Body disorder symptoms, pain ratings and pain frequency were considered suitable factors to assess musculo skeletal disorder.

Drudgery Index calculations

It was calculated total Drudgery/150*100. Drudgery level categorization on the basis of drudgery index (Table 2)

Where,

- Total drudgery = PL+P+RS+T+MSD+ PhyL.
- ML=Manual load (25 points)
- P = Postural load (25 points)
- RS= Repetitive strain load (25 points)
- T= Time load (25 points)
- MSD= Musculo skeletal disorders (25 points)
- PhsL= Physiological load (25 points)

Table 2: Drudgery level categorization on the basis of drudgery index

Drudgery Index %	Drudgery level	Expected heart rate
< 10	Very low	Upto 90
10-20	Low	91-105
20-30	Moderate	106-120
40-50	Very high	121-135
>50	Extremely high	136-150

Results and discussion

Physical characteristics of farm women: The anthropometric data of farm women have been presented in Table 3. The average age and height of the selected thirty farm women was 26 years and 160 cm respectively and the gross body weight was 52.4 kg. The average body mass index was 20.6 indicating that they were having normal body weight (Table 4).

Table 3: Selection criteria of farm women (N=30)

Physical characteristics	Range	Mean
Age (years)	18-45	26.0
Weight (kg)	145-175	160
Height (cm)	43-70	52.4
Body Mass Index	18-25	20.6

Table 4: Body Mass Index score of farm women (N=30)

BMI Score	Interpretation	BMI score of farm women (%)
< 18.5	Underweight	0
18.5-24.9	Normal	0
25-29.9	Overweight	100
> 30.0	Obese	0

(According to WHO Cut. off)

Man power, output and physiological workload

Man power: After using groundnut decorticator for groundnut dehulling, 91.66% man power was saved over traditional dehulling. On the other hand, 35.71% manpower was saved in groundnut crop weeding by hand wheel hoe one lane weeder in comparison to its traditional weeding with *Kudali.* Saving man power in both demonstrations also saved money which would be spent on man power.

Output

by groundnut decorticator, 25 kg of groundnut per hour were decorticated while 2 kg/hr. were decorticated by hands. With this demonstrated technology, 1150% output was increased. On the other hand the output was increased 45.75% by hand wheel hoe one lane weeder.

Physiological workload

On the basis of heart rate and energy expenditure, the activity of dehulling was moderate while using groundnut decorticator and light with traditional dehulling but the farm women worked with comfort and they did not had to do both tasks for longer period of time which in turn saved farm women's energy as well (Table 5).

Fig 1: Groundnut dehulling by groundnut decorticator by farm women

Fig 2: Groundnut weeding by hand wheel hoe one lane weeder by farm women

Table 5: Man power, Output and Physiological workload

Parameter	Traditional dehulling	Dehulling by Groundnut decorticator	% change	Traditional weeding	Weeding by hand wheel hoe one lane weeder	% change
Man power required (No/ha)	6	0.5	91.66	14	9.0	35.71
Output (kg/hr.)	2.0	25	1150	95.23 (m2/hr.)	138.8 (m2/hr.)	45.75
Av. Resting heart rate (beats/min)	72	72.1	0.13	73	73.5	0.68
Av. working heart rate (beats/min)	105	116	10.47	134	119	12.6
Av. Energy expenditure resting (kj/min)	5.14	5.15	0.19	5.21	5.25	0.7
Av. Energy expenditure working (kj/min)	7.5	9.66	28.8	12.40	9.91	25.12

Total Drudgery Index

In traditional dehulling of groundnut the percentage of drudgery index was found to be 50 which indicated very high level of drudgery in farm women in manual dehulling of groundnut while on the other hand, using groundnut decorticator for groundnut dehulling the percentage of drudgery index was 26 showing moderate level of drudgery in farm women.

When drudgery level was estimated between weeding by *Kudali* and weeding by hand wheel hoe one lane weeder in farm women, weeding of groundnut crop by *Kudali* had 86 percentage of drudgery index which indicated extremely high level of drudgery in farm women. While percentage of drudgery index was found to be 30 indicating moderate level of drudgery in farm women in Weeding by hand wheel hoe one weeder (Table 6).

Table 6: Total Drudgery Index

Parameter	Traditional dehulling	Dehulling by Groundnut decorticator	Traditional weeding	Weeding by hand wheel hoe one lane weeder
Manual load	10	10	20	10
Pastural discomfort	10	5	20	5
Repetitive work	20	5	20	5
Physiologically stressful work	5	10	25	10
Time demand	25	5	25	5
Musculo skeletal disorder	5	5	20	10
Total Drudgery	75	40	130	45
Total drudgery Index %	50	26	86	30

Conclusion

Groundnut dehulling and its weeding in crop stage are time consuming and tedious job. To minimize the efforts and reduce drudgery in farm women groundnut decorticator and Hand wheel hoe one lane weeder were demonstrated. In dehulling process of groundnut, 25 kg/hr. of groundnut Dehulling was found to be recorded by the use of groundnut decorticator in comparison with dehulling by hands that was recorded 2 kg/hr. In weeding of groundnut crop hand wheel hoe one lane weeder was found more effective and time saving as compared to *Kudali*. Hand wheel hoe one lane weeder did its job of weeding in one hectare area with 35.71% man power saving in comparison to traditional weeding methods. Groundnut decorticator and Hand wheel hoe one lane weeder were found to be the most appropriate for groundnut crop to reduce drudgery. Hand wheel hoe one lane weeder was found to be most efficient in moist soil while groundnut decorticator was most suitable for medium size pod of groundnut. If they will be Battery operated then they will be more effective.

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