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Women's Drudgery and Maize Sheller Intervention: A Case of Tribes of Jaunsar Region of Uttarakhand

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ABSTRACT

The seemingly simple act of removing the grains from maize cobs by hand is not easy as it sounds. Maize shelling is a tedious task which poses many physical hazards to the worker involved in the task. This risk increases many-a-folds in the regions where maize is grown as a cash crop as the intensity of task and workload increases during the particular season. Shelling maize manually is a task which seems very simple and convenient and it is assumed that it is an activity that is usually done in spare time. But the experiences of the worker involved in this activity reports the hazards and stress which this act poses to them. The present study is an attempt to record the potential biomechanical stress and occupational hazards perceived by the farmwomen of Jaunsar region of Uttarakhand and the role of power operated maize sheller intervened in mitigating these threats. The perceptions of women using the maize sheller were recorded before and after the intervention and the difference were found statistically significant. The findings exhibited an encouraging impact of the technology on women's efforts, time and discomfort.

1. Introduction

Maize means literally that which sustains life. It is, after wheat and rice, the most important cereal grain in the world, providing nutrients for humans and animals and serving as a basic raw material for the production of starch, oil and protein, alcoholic beverages, food sweeteners and, more recently, fuel. In some of the tribal belts of Uttarakhand hills, it is a main cash crop. One such tribe in Jaunsar region of Dehradun district of Uttarakhand depends upon maize as their major source of income. They grow maize and sell it particularly at festive time in winters for fetching money. At such times, maize shelling becomes a time bound activity. Though the activity seems light, women feel it as a maximum drudgery prone activity because of its monotony in performance, continuous sitting and performing it for a longer period of time.

Manual shelling is a time-consuming, slow and tedious operation. The traditional system for shelling maize is to press the thumbs on the grains in order to detach them from the cobs. This activity results in a lot of physical discomfort for the workers, resulting in damaged fingers with cuts and bruises. Also, continuous sitting in a definite posture also has its woes. Most importantly shelling maize by hands also consumes a lot of time too. Moreover the movements of thumb and fingers are repetitive and arms remain static which worsens the situation. A constant repetition of movements imposes a cumulative work load which can cause pain and weakness and impaired function of the muscles and other soft tissues (Gangopadhyay *et al.,* 2007). Azogu (2009) and D-Lab (2013) reported that an estimated 550 million small-holder farmers in the world lack access to mechanized agricultural technology like industrial maize shellers due to the cost (ranging from US$1,200-1,800) thus leaving rural dwellers with the option of shelling of high quantity of maize manually by hand or use of sticks. Various researches on the body posture adopted by the women workers while performing agricultural operations reveal that poor body postures may lead to increase in physiological workload and musculo- skeletal problems, thus accentuating drudgery.

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Drudgery is a term used to represent the dissatisfactory experiences on the part of worker that constraints work performance in any activity (Technical module/AICRP-FRM/DRWA/2009). Against this backdrop, a study on assessment of drudgery in maize shelling was conducted in Jaunsar region and suitable intervention was provided to reduce the workload and discomfort involved.

2. Materials and Methods

2.1 Study area

The Jaunsar tribal region in Uttarakhand, comprising of block Kalsi and Chakrata in the district of Dehradun, a traditionally maize growing area was selected purposively. Of the total 27,895 thousand hectare area under maize cultivation in Uttarakhand, district Dehradun with a total area of 9,115 thousand hectare accounts for about 33 per cent of the total maize area in the state. Of this, about 45 per cent is located in the hill region of the district represented mainly by Kalsi and Chakrata tribal blocks. Further, the villages adopted by ICAR VPKAS, Almora under Tribal Sub Plan scheme in Dhanpau-Lakwar cluster were selected purposively to carry out the study.

2.2 Research instruments used

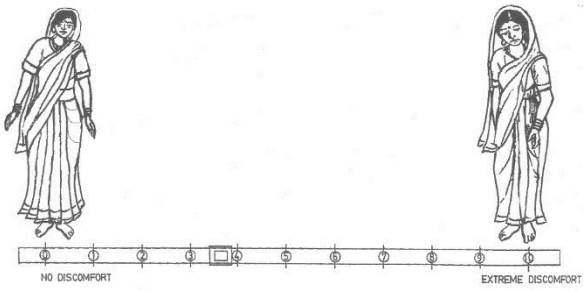
For evaluation of drudgery involved in maize shelling activity, subjective evaluation tools namely rated perceived exertion (RPE) and Overall discomfort scale (ODR) were used. Subjective, self-reported estimate of discomfort was assessed to examine overall discomfort rating using Visual Analogue Discomfort scale (Legg and Mahanty 1985). At the end of maize shelling activity, the respondents were asked to indicate their overall discomfort rating (0-no discomfort to 10-extreme discomfort) on the VAD scale. The ratings given by the subjects were added and averaged to get the mean rating.

Placement of Plate 1

To measure localized discomfort, Corlett and Bishop (1976) technique was used by dividing the subject's body into 13 regions and the subject was asked to indicate the regions in which they had intolerable pain/discomfort, moderate pain/discomfort and just noticeable pain/discomfort.

Plate 1 Visual Analogue

Placement of Plate 2



3. Results and Discussion

The results for the biomechanical stress in maize shelling among farmwomen of Jaunsar region and reduction in drudgery with the introduction of maize sheller are as below.

Table 1. Activity analysis of physical load of farmwomen in maize shelling

Activity	Hrs/day	No. of days/season	No. of labours employed (including self)	No. of man days/season
Maize shelling	4.03	18.77	3.4	32.169

Table 2. Body Part Discomfort Scores of the respondents in maize shelling

Body part	Just noticeable	Moderate	Intolerable	Mean score
Neck	12	5	1	1.39
Shoulder	8	7	3	1.72
Upper back	1	11	6	2.28
Upper arm	10	8	0	1.44
Elbows	16	2	0	1.11
Lower arm	0	5	13	2.72
Lower back	0	2	16	2.89
Wrist	0	2	16	2.89
Fingers/Palm	0	1	17	2.94
Thighs	13	5	0	1.28
Knees	8	6	4	1.89
Legs	6	12	0	1.67
Foot/Ankle	4	14	0	1.78

3.1 Activity analysis of maize shelling

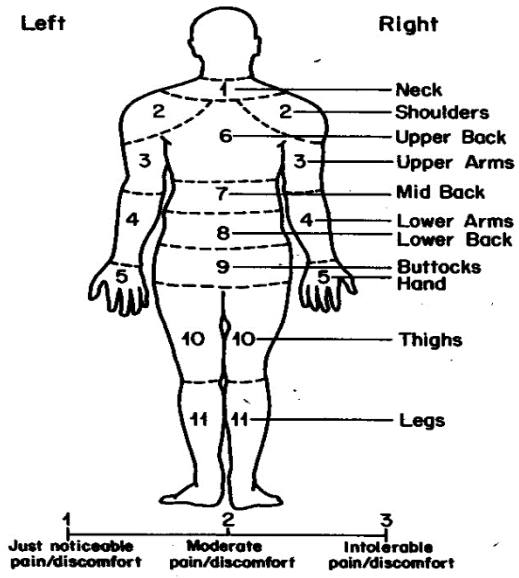
Small tools, often made by local artisans, are sometimes used to hand-shell maize. With these tools, a worker can shell 8 to 15 kg of maize an hour. Though the activity seems as a light one but women with their family members carry out maize shelling activity for about 4.03 hrs. /day. The total mandays per season were calculated as 32 for this activity. The main timing is usually evening between 7:00 pm to up to 11:00 pm or 12:00 pm. It's a time bound activity as they need to sell it during Diwali festival to fetch money.

Plate 2 Body Map Technique

Placement of Plate 3

Placement of Table 1

3.2 Assessment of biomechanical stress



Postural analysis of 15 farmwomen manually performing maize shelling activity was carried out by Rapid upper lumbar analysis (RULA) technique. For most of the respondents (80%), RULA score was found as 6 indicating further investigation of the task and change is required soon to eliminate the risk involved for the worker. It indicates that farm workers involved in maize shelling activities may become prone to work related musculoskeletal disorders due to prolonged awkward sitting posture with a high amount of repetitiveness. The physiologic problems that arise from repetitive work or overuse of certain muscles, tendons and soft-tissue structures have been addressed in terms of muscle fatigue, tissue density changes, and tissue strain (Valachi and Valachi, 2003). Physiologic evidence shows that the rate and degree of tissue damage depends on the amount of force, repetition and duration of exposure (Geronilla *et al.*, 2003). It calls for dire need for replacing the activity.

Plate 3 Jaunsari women shelling maize manually

3.3 Overall discomfort rating of the respondents

Subjective, self-reported estimate of discomfort was assessed to know overall discomfort rating using Visual Analogue Discomfort scale. Table 2 depicts the Overall Discomfort Rating (ODR) by the respondents performing the selected post-harvest activity.

Placement of Table 2

From Table 2, it can be observed that most discomfort was reported for fingers/palm (mean score: 2.94) followed by wrist and lower back (mean score: 2.89 each). Mean score for discomfort in lower arm was found as 2.72 being ranked as third part experiencing most discomfort followed by upper back (2.28) and knees (1.89). Body parts experiencing least discomfort were elbows (1.11), thighs (1.28), neck (1.39), *etc.* The mean Body part discomfort score (BPDS) score for the maize shelling activity was found as 26, ranging from 24 to 29 for each subject.

Placement of Table 3

As shown in Table 3, all the respondents complained of experiencing stiffness of hand/palm (100%) followed by cuts or wounds (100%) due to the sharp tool used. Approximately half of the respondents complained of repetitive strain injury (53.33%) and) and some (40%) complained for feeling numbness and burning sensation in fingers and palms as they need to rub their palms and fingers against the hard cobs for shelling. Sometimes the work is too tedious that it even interrupts with their routine tasks. Adewole *et al.* (2015) also reported that shelling of high quantity of maize by hand typically takes weeks and the hardened dried maize can

also be painful to shell thus leading to hand injuries. Keeping in view the hazard proneness of manual maize shelling manually in traditional manner, a power operated maize sheller was introduced in the selected village to a group of women.

Table 3. Hazards experienced during maize shelling (N=45)

Hazard Reported	Percentage
Blisters	86.67
Hardness/stiffness of hand/palm	100
Cuts/wounds	100
Numbness/Burning sensation	40
Repetitive strain injury	53.33

Placement of Plate 4

Field performance of maize sheller

Field performance of maize sheller was compared with the local practice and it was observed that the field capacity of the sheller was 200 kg/hr as compared to hand shelling, which was 20 kg/hr. The maize sheller intervention reduced the drudgery experiences of farmwomen while shelling maize by power operated maize sheller to nearly half *i.e.* rated perceived exertion by 58.77 per cent and overall discomfort by 49.58 per cent (Table 4).

Placement of Table 4

In the target cluster, an average 160 man-hours are spent on shelling maize (@20q maize/household). Introduction of maize sheller has reduced the time 8-10-fold and has resulted in significant reduction in drudgery (reduction in 'Exertion' from 6.33 to 2.61 and in 'Discomfort' from 7.28 to 3.67, in pre-deployment and post-deployment scenarios, respectively).

Placement of Table 5

It was observed that average man hours required to shell one quintal of maize manually were 8 man hours which were reduced to 0.5 man hours per quintal by using maize sheller (Table 5). It can be concluded that about 7.5 man hours can be saved in shelling a quintal of maize with the maize sheller introduced in the area.

Plate 4 Maize sheller intervention in the village

Sheller was found more effective in saving time with better shelling efficiency and good quality grain compared to their traditional practices. Similar studies have been conducted inferring saving of time and effort by use of technology in comparison to the traditional practice (Singh *et al.,* 2010; Pandey *et al.,* 2013). If the time saved is quantified in monetary gains, it can be concluded that a farmer/ labourer can earn Rs. 200.63 by utilizing the time saved into an agricultural activity. Besides this, the time saved can be utilized in taking up any enterprise through collective action or be utilized in caregiving task or as leisure.

Table 4. Subjective evaluation of maize shelling activity carried out by farmwomen manually and with maize sheller

Maize shelling	Traditional method	Maize Sheller	Per cent reduction in exertion/discomfort	t- value
RPE (Borg scale)	6.33	2.61	58.77	21.417**
ODR (Through VAS)	7.28	3.67	49.58	17.519**

*Sig at 5%level of significance

Table 5. Change in time and output after maize sheller intervention

Parameters	Manual	Maize sheller	Change
Output (kg/hr.)	20.93	200	**9.55 times increased**
Time (man hours/quintal)	8.0	0.5	**7.5 hrs. saved**
Monetary gain in wages on time saved (Rs.)	**200.63***		

*Calculated against Rs. 214 per day agricultural wage rate in Uttarakhand

Conclusion

Maize shelling is a tedious task which poses many physical hazards to the worker involved in the task. This risk increases many-a-folds in the regions where maize is grown as a cash crop as the intensity of task and workload increases during the particular season. The Jaunsar region of Dehradun is a maize cultivating belt of Uttarakhand where maize is a crop on which the farmers depend upon for their livelihood. In this area, it was observed that tribal women farmer in Jaunsar were intensively involved in the post-harvest operations of maize crop and thereby were a potential victim of the hazards associated with maize shelling. Maize shelling is a tedious task which seems very simple but poses many potential risks or hazards to the worker involved in the task. This risk increases many-a-folds in the regions where maize is grown as a cash crop as the intensity of task and workload increases during the particular season. Being empathized with the plight of these women farmer and ensuring their agricultural health and safety, ICAR-VPKAS, Almora introduced a power operated maize sheller in the area. Studies on drudgery in maize shelling were carried out and effect of the maize sheller on the women farmer was assessed. The women are contented with the technology which reduced the potential hazards involved thereby improved their work efficiency as well significantly.

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