INTRODUCTION

Raichur district in Karnataka is considered as rice bowl of Karnataka with the major crop being paddy grown under irrigated conditions in both Upper Krishna (UKP) and Tungabhadra Project (TBP) area. Transplanting of the rice seedlings either manually or mechanically was the major method followed by the farming community. Manual transplanting is one of the labor intensive operation comprising of nursery raising, uprooting of the seedling and transplanting them in the main field, with total labor requirement of about 280-350 man-hours/ha. Some of the posture which were taken by them were very harmful. But they were compelled to adopt those postures during work for a long time. During transplanting the workers adopt strongly bent posture in the muddy field for a long time. In all the tasks of rice cultivation are repetitive in nature. Repetitive may be related to Musculoskeletal Disorders (MSD). The workers change their posture very frequently and suffered from musculoskeletal disorder during performing their jobs (Kar and Dhara, 2007). High labor demand during peak transplanting period adversely affects the timeliness of this operation, thereby reducing crop yield.

Due to poor rainfall during last two years, there was irregular release of water through canals which made the farmers to go for an alternative method of sowing rice i.e., Direct Sowing of Rice. The data on rainfall of Raichur district reveals that in the year 2011-12 the actual rains received was 467.80 mm and during 2012-13 it was 469.89 against 620 mm. In such condition farmers adopted DSR as an alternate to transplanted technique of rice cultivation. The DSR is advantageous over transplanting method in many respects i.e., labour saving, promotes the soil health, saves water, saves cost of fuel incurred towards puddling and thereby prevents the air pollution. It is the experience of the farmers that, if planned properly, with the use of pesticides the weed menace in DSR could be resolved i.e., by delaying the sowing by one week after the first rainfall or else with the use of recommended weedicide when sprayed at proper time. The farmers sow the rice when the soil is dry and after the rains the weeds and seeds

ABSTRACT

The performance of five type of weeders viz., cycle weeder, twin wheel hoe weeder, cono weeder, three blade weeder, and a local make designed by the farmers themselves were assessed and compared in direct sown paddy crop. The parameters of assessment included weeding efficiency, plant damage, musculoskeletal disorders, and cost economics. The results showed that, twin wheel hoe weeders in DSR has highest percentage of weeding efficiency, highest performance index, lowest plant damage and is economical to the tune of 60 per cent. Using twin wheel hoe weeder can destroy weeds by completely or partially burying weeds, uprooting and breaking the weed root contact with the soil. The use of weeders at 20-25 days after sowing (DAS) proved to be more beneficial than at later stage. The efficiency of the weeder was found to be 0.3 ha./d/man labour day vs 20-25 women/d/ha. The timely weeding and application of fertilizers is ensured in case of weeding done with twin wheel hoe weeder, while the labour dependency and timely availability of labours is a major problem in manual weeding.

Key Words: Weeders, Direct Seeded Rice, Musculoskeletal Disorders.
germinate together making the field unmanageable. Hence, weeds menace is considered as a major problem in DSR. The timely unavailability of agriculture labours is a major problem in such conditions. The data on drudgery aspects revealed that direct sowing of seed results in expected outcome of the technology in the form of low draft requirement, labour saving, natural resource conservation, better output/profits and less occupational health hazards (Sucheta and Oliver, 2012). This fact was perceived as one of the problems analysed by KVK Raichur and an On Farm Testing (OFT) to assess the different weeders in DSR was planned during 2013-14. The present study was conducted by KrishiVigyan Kendra Raichur with the objectives to assess the performance of different type of weeders in DSR, to assess the drudgery, to calculate the time saved in using each type of weeders and to compare the cost of operation of different weeders.

MATERIALS AND METHODS

Selection of beneficiary

The beneficiaries were selected based on three criteria (i) who are practicing the direct sowing of paddy, (ii) who are willing to participate (iii) whose crop was about 20-25 d old.

Type of weeders

The performance of five type of weeders viz., cycle weeder, twin wheel hoe weeder, conoweeder, three blade weeder, and a local make designed by the farmers themselves were used for weeding in DSR. Among these, three types of weeders i.e., the cycle weeder, three blade weeder and a local make designed by the farmers were collected by the researcher and the other two types of weeders i.e., conoweeder and twin wheel hoe weeders from the Department of Farm Power Machinery, College of Agriculture Engineering, University of Agricultural Sciences were used to assess the performance. The performance was compared with handweeding method.

Weeding efficiency (WE): was calculated using the quality work carried by a machine in terms of number of weeds cut uprooted and damage to the crop plants while operation (Srinivas et al, 2010).

\[ WE (\%) = \frac{W1 - W2}{W1} \]

where W1=number of weeds before weeding

W2=number of weeds after weeding

Plant damage (PD)

Plant damage was assessed by calculating the number of damaged plants per M2 area while weeding.

Rapid Entire Body Analysis (REBA) tool developed by Hignett and McAtamney (2000) to assess the Musculoskeletal disorders was used.

The cost economics was calculated using the total number of labours employed per day per 0.4 ha. in all the methods of weeding.

Statistical Analysis: Mean, frequency and percentage were used to analyse the results.
RESULTS AND DISCUSSION.

The sample consisted of 30 farmers belonging to age group of 25-50 yr who were working regularly in the field. The sample for hand weeding method consisted of 12 women farmers from Anjaneya camp adjacent to Kasabe camp, Raichurtaluka. These women farmers belonged to the age group of 20-48 yr. All these respondents did not have any complaints of illness during the study period.

The weight of the weeder revealed that, the three blade weeder has highest weight (16 kg) as compared to all the weeder followed by cycle weeder (11 kg), which adds to drudgery to the person operating it. With regard to weeding efficiency, the twin wheel weeder has the highest weeding efficiency (88%) next only to manual weeding (94%) as compared to other weeder. The local make and cycle weeder had the weeding efficiency up to 85 and 80 per cent, respectively.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Twin wheel weeder</th>
<th>Cycle weeder</th>
<th>Conoweeder</th>
<th>Three blade weeder</th>
<th>Local make</th>
<th>Hand weeding method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight of the tool (kgs)</td>
<td>5</td>
<td>11</td>
<td>6</td>
<td>16</td>
<td>5</td>
<td>0.5</td>
</tr>
<tr>
<td>Weeding efficiency (%)</td>
<td>88</td>
<td>80</td>
<td>-</td>
<td>76</td>
<td>75</td>
<td>94</td>
</tr>
<tr>
<td>Plant damage (No.)</td>
<td>5-6</td>
<td>7-8</td>
<td>-</td>
<td>11</td>
<td>7-8</td>
<td>4</td>
</tr>
<tr>
<td>REBA Score</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>10</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>Cost of operation (Rs./.0.4 ha)</td>
<td>600</td>
<td>800</td>
<td>-</td>
<td>200</td>
<td>800</td>
<td>1500</td>
</tr>
<tr>
<td></td>
<td>(40.0%)</td>
<td>(53.3%)</td>
<td></td>
<td>(13.0%)</td>
<td>(53.3%)</td>
<td>(100%)</td>
</tr>
</tbody>
</table>

* The figures in parenthesis indicate percentage.
Although the cycle weeder and the local design had the little higher percentage of weeding efficiency (80 and 75 per cent, respectively), yet the farmers did not accept them much because of the height and weight, the cycle weeder was swaying with the blowing wind. The local make needs regular attention as the moist mud gets adhered to it and needs to be regularly cleared. Another hurdle as expressed by the farmers is a sickle is essential to clear the mud which needs to be tucked to the weeder which is an added weight (500 g). Thus the local design was not preferred by them. The conoweeder was not suitable for Direct seeded rice, hence the observations could not be made.

Results with regard to plant damage, when weeding with different weeders revealed that, three blade weeder had the highest number of plants uprooted/damaged (11 no.) which is due to uncertainty with blade, the direction of which is not assured in matching all the tree rows. The cycle weeder and the local weeder had the same number of plants damaged while weeding (7-8). Hand weeding had the lowest plant damage (4 no.) followed by twin wheel weeder.

<table>
<thead>
<tr>
<th>REBA Score</th>
<th>Risk level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Negligible</td>
</tr>
<tr>
<td>2-3</td>
<td>Low</td>
</tr>
<tr>
<td>4-7</td>
<td>Medium</td>
</tr>
<tr>
<td>8-10</td>
<td>High</td>
</tr>
<tr>
<td>11-15</td>
<td>Very High</td>
</tr>
</tbody>
</table>

Rapid Entire Body Assessment score as an indicator of drudgery in weeding, revealed that, the manual weeding was the highest REBA score (14) followed by weeding with three blade weeder (10) which adds to the aggravation of Work Related Musculoskeletal disorders. The weight of the three blade weeder and the adoption of posture in manual weeding are the major reasons for the increase in the REBA score. Rest of the weeders had the similar REBA score which indicates that, the weeding activity with weeder adds to medium drudgery level on the person using it. The results are in line with the study conducted by Ojha and Kwatra (2012), which indicated that, the pain and discomfort with the locomotive organs persisted in manual uprooting and transplanting activities.

The cost of operation of different weeders revealed that, manual weeding was the costliest among the all the methods. The availability of the labour during peak season is added burden to the farmers. Although weeding with three blade weeders incurs only 13 per cent of the total cost incurred towards weeding, yet it was not accepted because of the weight of weeder. The cost of operation of weeding with twin wheel weeder is 40 per cent as that of manual weeding. The local make and the cycle weeder had the similar cost of operation i.e., 53.3 per cent as that of manual weeding.

CONCLUSION

It was concluded that the twin wheel weeder was suitable for weeding in DSR when the crop is about 20-25 d with optimum moisture in black soil. The twin wheel weeder with L shape blade was recommended for interrow crops’ weeding and it churns the soil by uprooting the weeds. The cost of operation was only 40 per cent as compared to the manual weeding with REBA score of 4 and with minimum plant damage (5-6) and weight is only 5 kg. The weeder with average blade length of 8 inches was best suited for DSR when the interrow spacing is 25 cm. The study implies that weeders reduce the drudgery in weeding hence may be supplied along with the inputs at subsidized rates to farmers. Training of local fabricators to manufacture the weeders may be organized. The agriclinic and agribusiness sector may take the manufacturing of weeders as one of their components. Weeders to suit all the crops and all the interrow spacing may be designed to facilitate drudgery reduction and in turn reduce the dependency on agricultural labourers. The gender discrepancies in wages may be eradicated so as to facilitate the farm women to use these weeders.

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On Farm Testing on Assessment of Different Type of Weeders

REFERENCES


