

RESEARCH ARTICLE :

Cono weeder: An economic hand tool for women labour in paddy field

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ARTICLE CHRONICLE :

Received :

02.04.2016;

Revised :

17.03.2016;

Accepted :

18.04.2016

KEY WORDS :

Cono weeder, Paddy, Hand tool

SUMMARY : Rice (*Oryza sativa* L.) is one of the most leading food crops in the world within the worldwide-cultivated cereals, and is second only to wheat in terms of annual food consumption. Rice is major crop of Konkan region of Maharashtra. Weeds are the major problem in rice crop. Weeding operation in rice field is very tedious and drudgeries and time consuming operation as it done manually. Hence, to reduce the drudgery and force requirement, it is necessary to develop women friendly cono weeder as per the feedback received from women workers with ergonomic consideration. The actual field capacity for cono weeder (DBSKKV) and cono weeder 1 (Double handled), cono weeder 2 (Single handled) were found to be 0.0094 ha/h, 0.0110 ha/h and 0.0133 ha/h. The field efficiency for cono weeder (DBSKKV) and cono weeder 1 (Double handled), cono weeder 2 (Single handled) were found to be 56.98 per cent, 64.77 per cent and 79.35 per cent, respectively. The weeding efficiency of cono weeder (DBSKKV) and cono weeder 1 (Double handled), cono weeder 2 (Single handled) were found to be 74.01 per cent, 79.82 per cent and 84.58 per cent, respectively. The cost of cono weeder (DBSKKV) and developed cono weeder 1 (Double handled), cono weeder 2 (Single handled) were Rs. 1150/-, Rs.800/- and Rs.785/-, respectively. The operating cost of cono weeder (DBSKKV) and developed cono weeder 1 (Double handled) and cono weeder 2 (Single handled) were Rs. 24.74/-h, Rs. 24.06/-h, Rs. 24.04/-h, respectively.

How to cite this article : Shirsat, N. A., Chavan, S.S., Aware, V. V. , Shahare, P. U. , Dhande, K. G. and Aware, Seema V. (2016). Cono weeder: An economic hand tool for women labour in paddy field. *Agric. Update*, **11**(2): 154-157 (DOI : 10.15740/HAS/AU/11.2/154-157).

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BACKGROUND AND OBJECTIVES

Rice (*Oryza sativa* L.) is one of the most leading food crops in the world within the worldwide-cultivated cereals and is second only to wheat in terms of annual food consumption (Alizadeh, 2011). India is the world's second largest rice producer and consumer next to china. The area under rice cultivation in India is 44.78 million hectares with annual production of 106.54 million tones

and productivity was 3.0 tones/hectares. (Anonymous, 2014a and b).

In Maharashtra, rice is cultivated over an area of 16.12 lakh hectares with an annual production of about 32.37 lakh tones and productivity was 2.01 tones/ha (Anonymous, 2014). Rice is the main food grain crop of Konkan region which occupies an area of about 4.40 lakh hectares with production of 15.10 lakh tones and productivity was 3.56

tones/ha (Anonymous, 2014). The weeds have always been problems in the cultivation of crops as they lower the yield and quality. Weeds also may directly reduce profits by hindering harvest operations and producing chemicals that are harmful to crop plants. Weeds left uncontrolled may harbor insects and diseases and produce seeds and rootstocks. Weeds can also be potential carriers of infections, fungus and other diseases, which can contaminate the crops (Biswas *et al.*, 2000a and b). Weeding operation in rice field is very tedious and drudgeries and time consuming operation as it done manually. Hence, to reduce the drudgery and force requirement, it is necessary to develop women friendly cono weeder as per the feedback received from women workers with ergonomic consideration.

Biswas (1990) reported that mechanical weed control not only uproots the weeds between the crop rows but also keeps the soil surface loose, ensuring better soil aeration and water intake capacity. Manual weeding gave a clean weeding but it is a slow process. Anantachar *et al.* (2013) conducted the performance evaluation of cono weeder for paddy in farmer's field. The field capacity was in the range of 0.016 to 0.019 ha/h with a field efficiency in the range of 59.23 to 62.07 per cent. The weeding efficiency was observed in the range of 72.00 to 85.00 per cent. The average effort required to push the cono weeder was 14.4 kgf. Quadari (2010) designed, constructed and tested of manually operated weeder could works on the soil at the depth of 2.5 cm with the actual field capacity and theoretical field capacity was 0.296 m²/s and 0.3 m²/s, respectively. The field efficiency was found to be 98.67 per cent. The average weeding efficiency was found to be 93.75 per

cent.

RESOURCES AND METHODS

The cono weeder is used for uprooting and burying weeds in between standing rows of rice crop in wetlands. Two truncated rollers one behind other are fitted at the bottom of the long handle. The conical rollers have serrated blades on the periphery. A float provided in the front portion prevents the unit from sinking into the puddle soil. It disturbs the top soil and increases the aeration. The unit consists of a long handle made of mild steel tube.

Development of cono weeders :

During the performance testing of cono weeder (DBSKKV), the feedbacks received from the women workers that the weight of cono weeder was more and it is very difficult to operate in the field. It was very difficult and uneasy to pull, push and lift and turn the weeder in the head land due to the added unbalanced weight of mud on float. The force requirement was also more. Hence, to reduce the drudgery and force requirement while operate the cono weeder (DBSKKV) as shown in Fig. A, it felt necessary to develop the women friendly cono weeders. According to women friendly cono weeders have been developed cono weeder 1 (Double handled) and cono weeder 2 (Single handled) with ergonomic design consideration shown in Fig. B and Fig. C. The operating cost of all the cono weeders includes fixed cost and variable cost was determined by formulas given below. The life of cono weeders and its use per year are considered as 10 years and 100 h/yr, respectively.



Fig. A : Cono weeder (DBSKKV)



Fig. B : Cono weeder 1 (Double handled)



Fig. C : Cono weeder 2 (Single handled)

Table 1: Performance evaluation for cono weeder (DBSKKV) and newly developed women friendly cono weeders

Sr. No.	Parameters	Cono weeder (DBSKKV)	Cono weeder 1 (Double handled)	Cono weeder 2 (Single handled)
1.	Travelling speed, km/h	1.66	1.71	1.69
2.	Theoretical field capacity, (ha/h)	0.0166	0.0171	0.0169
3.	Actual field capacity, (ha/h)	0.0094	0.0110	0.0133
4.	Field efficiency, (%)	56.98	64.77	79.35
5.	Weeding efficiency, (%)	74.01	79.82	84.58

OBSERVATIONS AND ANALYSIS

The performance evaluation of cono weeder (DBSKKV) and developed cono weeder 1 (Double handled) and cono weeder 2 (Single handled) has been conducted as per RNAM test code. The performance evaluation for cono weeder (DBSKKV) and newly developed women friendly cono weeders are as given in Table 1.

The travelling speed of cono weeder (DBSKKV) and developed cono weeder 1 (Double handled), cono weeder 2 (Single handled) were 1.66 km/h, 1.71 km/h and 1.69 km/h, respectively. The theoretical field capacity was found to be 0.0166 ha/h, 0.0171 ha/h and 0.0169 ha/h for cono weeder (DBSKKV) and developed cono weeder 1 (Double handled), cono weeder 2 (Single handled), respectively. The actual field capacity for cono weeder (DBSKKV) and cono weeder 1 (Double handled), cono weeder 2 (Single handled) were found to be 0.0094 ha/h, 0.0110 ha/h and 0.0133 ha/h.

The field efficiency for cono weeder (DBSKKV) and cono weeder 1 (Double handled), cono weeder 2 (Single handled) were found to be 56.98 per cent, 64.77 per cent and 79.35 per cent, respectively. The weeding efficiency of cono weeder (DBSKKV) and cono weeder 1 (Double handled), cono weeder 2 (Single handled) were found to be 74.01 per cent, 79.82 per cent and 84.58 per cent, respectively.

Cost economics of cono weeders :

The cost of cono weeder (DBSKKV) was Rs. 1150/- where as the initial cost. The initial cost of developed cono weeder 1 (Double handled), cono weeder 2 (Single handled) were Rs. 800/- and Rs.785/-, respectively. The operating cost of cono weeder (DBSKKV) and developed cono weeder 1 (Double handled) and cono weeder 2 (Single handled) were Rs. 24.74/-h, Rs. 24.06/-h, Rs. 24.04/-h, respectively.

Conclusion :

The actual field capacity of cono weeder (DBSKKV) were increased by 17.02 per cent and 41.48 per cent in developed cono weeder 1 (Double handled) and cono weeder 2 (Single handled), respectively. The field efficiency of cono weeder (DBSKKV) were increased by 13.67 per cent and 39.25 per cent in developed cono weeder 1 (Double handled) and cono weeder 2 (Single handled), respectively. The weeding efficiency of cono weeder (DBSKKV) were increased by 7.85 per cent and 14.28 per cent in developed cono weeder 1 (Double handled) and cono weeder 2 (Single handled), respectively.

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