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Ergonomic Assessment of Selected Technologies Developed for Drudgery Mitigation in Turmeric Production System

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A B S T R A C T

The present work was carried out in Parbhani District of Marathwada region in Maharashtra state. Selected thirty women were aged between 20 to 50 yrs., having average height 145.68 cm., body weight 52 kg. and average annual income was Rs.64,346/-. Maximum respondents were performing agricultural activities for more than 15 years and most of them were working for 6 to 8 hr. in the field. About 77 percent farm workers noted to be working for 7 days in a week. All the farmers were unaware about the hand operated machines available for planting, earthing up and cleaning & sorting activities. After performing these activities continuously for 6 hr., major health problems of the farm women reported were burning sensation to the skin, skin peeling and allergy. Hence, small digging tool (*Ukari* for planting rhizomes*)*, earthing up tool (*Sawdi*),, and mittens for cleaning & sorting were developed and tested. Ergonomic assessment revealed that physiological cost of selected activities performed by farm women in existing and improved method was at par but perception of work load was found to be reduced (23-32%) in improved method. All the developed technologies used by farm women in turmeric production system for planting, earthing up, and cleaning & sorting were successful in increasing pace of work. In all these activities, the output was significantly increased by 20-26 per cent due to use of developed technologies.

Introduction

Women are workforce of agriculture and important part of Indian economy. There is a gradual increase in realization of the key role of women in agricultural development and their involvement in the field of agriculture, food security, horticulture and other allied sectors. Women as farm labourers, participate in various activities such as seeding, cutting, planting, weeding, fertilizer spreading, plant protection, thinning, harvesting, treating, selling, sorting, care of animals, kitchen gardening etc. It is estimated that activities during peak period, women work every day for about 8-9 hr. in agriculture and

four hours in household activity. The Indian women, especially in the poverty group work for above five hours per day more than the Indian man in work, including visible burden of family.

As per the recent findings, women in India are the major producers of food in terms of value, volume and number of hours worked (Mrunalini *et al.*, 2015).

Drudgery can be reduced by providing gender friendly farm tools and equipment which increase the productivity of worker with safety and comfort to her. Time scheduling is also needed for achieving such task.

Drudgery is term for hard work, monotony, time consuming, use of traditional tools with inappropriate working posture in field. So one way of reduction of drudgery can be through quantifying the particular field operation.

Materials and Methods

Ergonomic evaluation of selected farm activity

Total 30 healthy farm workers working in the field for 6-7 hrs/ day and 6 days/ week and having minimum five years' experience of work in turmeric production were selected for the study.

Mode of data collection

No. of female workers : 30

Field trials/Replications: 03

No. of farm activities : 03

No. of methods : 02

Equipment used for the study

Polar heart rate monitor, Anthropometry kit, Sphygnomano meter, Grip dynamometer, weighing balance

Measurement of Parameters

Following Measurement Parameters were used while making questionnaire for the study

Average working Heart Rate **(**$b.m^{-1}$)

Average Peak Heart rate **(**$b.m^{-1}$)

Average & peak energy expenditure **(**$kj.m^{-1}$)

Total cardiac cost of work (TCCW)

Physiological cost of work (PCW)

Parameters used to assess the drudgery experiences

RPE (Rated perceived exertion).

Very light (1), Light (2), Moderately light (3), Heavy (4), Very heavy (5). Varghese *et al.*, (1994).

't' test

't' test was used to find out the mean differences in variables (Sharma 2005).

Results and Discussion

General information of the respondents working in turmeric production system

Personal information such as age, cast, education, and family information such as land holding, occupation and annual income were noted down during the survey. It was found that selected women respondents were in the age range of 20 to 50 yrs.

The average age of the respondents was 43 years. On an average height of the selected farm women was 145.68 cm. average body weight of the selected respondents was noted 52 kg.

Maximum respondents were performing agricultural activities for more than 15 years and most of them

were working for 6 to 8 hr. in the field. About 77 percent farm workers noted to be working for 7 days in a week. Regarding annual income an average annual income of the family was Rs.64,346/-.

Drudgery experience in existing method of turmeric production system

Drudgery experience due to work demand and filling of exhaustion

As per the work demand score all the activities performed in turmeric production system were very time demanding and very exhausting as per the psychological feeling of the farm women.

Posture assumed in work and frequency of the posture change

Majority of the selected farm women opined that posture adopted while working in the turmeric production system such as squatting and bending are very difficult, but as frequency of posture change was less, planting activity is performed continuously in squatting posture were perceived less difficult.

Difficulty and workload perception

Majority of the selected farm women reported that majority of the activities in turmeric production system are very painful. Similarly as per the workload perception, these activities categorized under very heavy activities.

Perception on manual load operatives

Perception of the manual load operative was based on total load carried out by farm workers while performing activities in turmeric production system.

It was noticed that in majority of the activities less than 5 kg weight is carried, whereas while fertilizer application and sorting turmeric roots 5 to 10 kg load needs to be carried.

Physiological load of women worker while performing planting turmeric rhizomes/roots in turmeric production system

Physiological workload of the selected women workers while performing selected activities in turmeric production system was assessed by heart rate method. Selected parameters such as working heart rate, peak heart rate, energy expenditure, peak energy expenditure, cardiac cost of work (CCW), total cardiac cost of work (TCCW) and physiological cost of work (PCW) were compared in existing and improved method. In improved method work was performed by the farm workers with the help of developed tools such as digging tool, earthing up tool, and mittens

Table 1.and table 2 shows Physiological load of women workers while performing planting rhizomes/ roots and earthing up activity in turmeric production system. In case of planting, and earthing up activities, working heart rate and its corresponding parameters were found to be decreased in improved method, but statistically results were non-significant.

Table 3 shows physiological load of women workers while performing sorting and cleaning activity (with the help of mitten) in turmeric system. It is seen that peak heart rate and total cardiac recovery were decreased in improved method and statistically difference was significant. In conclusion it can be said that physiological cost of selected activities performed by farm women in existing and improved method was at par.

Rated perceived exertion

Rated perceived exertion was highest for planting, earthing up and Sorting & cleaning in exiting method. There was significant decrease in RPE by 23-32 per cent in improved method of planting, earthing up, and Sorting & cleaning activities. All the selected activities in turmeric production system were perceived as very heavy activities by all the selected farm women in existing method.

Table.1 Physiological load of women workers while performing planting rhizomes/ roots in turmeric production system

(N = 30)

Particulars	Existing method (Mean ± SD)	Improved method (Mean ± SD)	Increase/ decrease improved over existing
Working heart rate (bm^{-1})	105 ± 15.5	103 ± 14.23	2 (1.9)
Peak heart rate (bm^{-1})	118 ± 17.88	114 ± 16.39	4 (3.38)
Energy Expenditure (kjm^{-1})	8.02 ± 2.46	4.72 ± 2.26	0.3 (3.74)
Peak Energy Expenditure(kjm^{-1})	10.08 ± 2.84	9.34 ± 2.6	0.74 (7.34)
CCW (Beats)	304 ± 123	254 ± 116.91	50 (16.44)
CCR (Beats)	32 ± 22.68	33 ± 29.55	-1
TCCW (Beats)	336 ± 142.21	287 ± 134.02	49 (14.58)
PCW (Beats)	34 ± 16.29	33 ± 18.22	1 (2.94)
Work load category as per heart rate	5 Very Heavy	3.4 Moderate	1.6 (32)
't' value(Existing Vs. Improved)	NS		

CCW - Cardiac cost of work, CCR - cardiac cost of recovery, TCCW-Total cardiac cost of work, PCW - Physiological cost of work, NS - Non significant ,RPE-Rated perceived exertion, Figures in parenthesis indicates percentages

Table.2 Physiological load of women workers while performing earthing up activity in turmeric production system

(N = 30)

Particulars	Existing method (Mean ± SD)	Improved method (Mean ± SD)	Increase/ decrease improved over existing
Working heart rate (bm^{-1})	118 ± 8.19	117 ± 15.82	1 (0.84)
Peak heart rate (bm^{-1})	126 ± 8.76	125 ± 16.35	1 (0.49)
Energy Expenditure (kjm^{-1})	10 ± 1.3	10 ± 2.5	0
Peak Energy Expenditure(kjm^{-1})	11 ± 1.39	11 ± 2.6	0
CCW (Beats)	587 ± 405.92	530 ± 144.53	57 (9.71)
CCR (Beats)	40 ± 12.37	39± 44.18	1 (2.5)
TCCW (Beats)	627 ± 404.12	570 ± 167.7	57 (9.09)
PCW (Beats)	45 ± 8.31	47 ± 19.81	-2
Work load category as per heart rate	5.0 Very heavy	4.0 Heavy	1 (16.66)
't' value(Existing Vs. Improved)	NS		

CCW - Cardiac cost of work, CCR - cardiac cost of recovery, TCCW-Total cardiac cost of work, PCW - Physiological cost of work, NS - Non significant ,RPE-Rated perceived exertion, Figures in parenthesis indicates percentages

Table.3 Physiological load of women workers while performing sorting & cleaning activity (With the help of mittens) in turmeric production system

(N = 30)

Particulars	Existing method (Mean ± SD)	Improved method (Mean ± SD)	Increase/ decrease improved over existing	'T' Value
Working heart rate (bm^{-1})	99 ±6.7	95±7.11	4 (4.04)	NS
Peak heart rate (bm^{-1})	108±6.56	100±7.67	8 (7.40)	**2.5***
Energy Expenditure (kjm^{-1})	7.06±1.06	6.38±1.13	0.68 (9.63)	NS
Peak Energy Expenditure(kjm^{-1})	8.38±1.04	7.49±1.22	0.89 (10.62)	NS
CCW (Beats)	225±87.72	164±61.7	61 (27.11)	NS
CCR (Beats)	19±11.31	10±5.62	9 (47.36)	**2.25***
TCCW (Beats)	244±93.08	174±65.24	70 (28.68)	**NS**
PCW (Beats)	28.57±7.5	23.29±7.53	5.28 (18.48)	NS
Work load category as per heart rate	4 Heavy	2.8 Moderate	1.2 (30)	

CCW - Cardiac cost of work, CCR - cardiac cost of recovery, TCCW-Total cardiac cost of work, PCW - Physiological cost of work, NS - Non significant, RPE-Rated perceived exertion, Figures in parenthesis indicates percentages, *- significant at 5%

Table.4 Rating of perceived exertion (RPE) of farm women while performing selected activities in turmeric production system

Particulars	Existing method (Mean ± SD)	Improved method (Mean ± SD)	Increase/ decrease improved over existing	'T' Value
Planting turmeric rhizomes (n=10)	4.7+1.36	3.6+1.01	1.1 (23.4)	2.05*
Earthing up (n=10)	4.6+1.2	3.09+0.98	1.51 (32.82)	3.14**
Sorting & cleaning (n=10)	3.5±0.52	2.6±0.69	0.9 (25.71)	3.29**

*- significant at 5%, **- significant at 1%, Figures in parenthesis indicates percentages

Table.5 Time and work study of the selected activities in turmeric production system

Particulars	Existing method (Mean ± SD)	Improved method (Mean ± SD)	Increase/ decrease improved over existing	'T' Value
Planting of turmeric rhizomes by using Ukari [area : m/hr]	104.71±30.17	132.32±36.3	27.61 (26.36)	1.85*
Earthing up [area : m/hr]	68.91± 5.95	83.78±8.64	14.87 (21.57)	4.43**
Sorting & cleaning (n=10)	73.86 ± 16.44	88.91 ± 18.69	15.05 (20.37)	1.91*

*- significant at 5%, **- significant at 1%, Figures in parenthesis indicates percentages

In improved method, all respondents felt that the work load is reduced and activity is moderately heavy. In conclusion, Perception of work load was found to be reduced in improved method (Table 4). The results are in line with the results of Zend *et al.*, (2015) for characterization of drudgery of farm women in soybean production system.

Time and work study of the selected activities in turmeric production system

Time and work study of the selected activities in turmeric production system revealed that planting rhizomes earthing up activity and cleaning and sorting activities by using developed tools were significantly superior over existing methods. In all these activities, the output was significantly increased by 20-26 per cent. It can be concluded that all the developed technologies used by farm women in turmeric production system for planting, earthing up, and cleaning and sorting activities were successful in increasing pace of work (Table 5).

Ergonomic assessment revealed that physiological cost of selected activities performed by farm women in existing and improved method was at par but perception of work load was found to be reduced in improved method. All the developed technologies used by farm women in turmeric production system for planting earthing up, and cleaning and sorting were successful in increasing pace of work. In all these activities, the output was significantly increased by 20-26 per cent.

References

Mrunalini A., Esther S., Deepika J. (2015). 'Characterization of drudgery in vegetable production system'. Int. J. Sci. Res. 4(4):256-258, ISSN No.- 2277-8179

Sharma, H. L. (2005). 'Basic statistical methods with application'. Agrotec publishing academy, Udaipur pp: 78,261, 306, 331.

Varghese M. A., P. N. Saha and N. Atreya (1994). 'A rapid appraisal of occupational workload from a modified scale perceived exertion'. Ergonomic. 37:485-495.

Zend J. P., Revanwar M. S. and Admankar S. N. (2015). 'Characterization of drudgery of farm women in soybean production system'. Ergonomics in caring people, proceedings of HWWE 2015 (Springer publication): 125-130. ISBN 978-981-10-4980-4 (ebook).

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