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Physical Strain of Women Workers in Rice Cultivation System

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***Abstract*—** *Women are involved in planting, transplanting, weeding, harvesting and processing activities in paddy cultivation system. These operations are most drudgeries activities performed by them. During these operations the women face many physical and physiological problems. Keeping this in view the physical strain with respect to working heart rate (WHR), Oxygen consumption rate (OCR), Energy expenditure rate (EER), Relative cost of workload (RCWL) of selected fifteen women workers were evaluated. The workers were selected in the age group of 15-45 years. Their age, weight, height, body surface area were observed to be 31.1 years, 51.7 Kg, 152.3 cm and 1.46 m^2 respectively. The major benefits of introducing improved tools for the selected operations are mainly avoiding bending posture resulting reduction in musculoskeletal disorder. The anthropometric measurement like stature, vertical reach, vertical grip reach, acromial height, elbow height etc were measured with the help of Integrated Composite Anthrop-meter. OUAT 3 row rice transplanter, mandwa weeder, improved sickle , OUAT pedal thresher were evaluated and compared with that of local method of transplanting in bending posture, weeding in squatting position, harvesting with local sickle and threshing by beating of paddy bundles . The mean value of working heart rate of selected women subjects were observed to be 114. 5 beats/min in case of manual transplanting against 126.5 beats/min in case of OUAT three row rice transplanter. But in case of Mandwa weeder, Improved sickle and OUAT pedal thresher, the WHR recorded to be 122.8, 120.4 and 128.9 beats/min respectively. The OCR and EER followed the same trend. The field capacity of these improved tools were more than that of local method of operations. The overall discomfort score using a 10 point VAD scale in 34 body parts observed that higher discomfort score was recorded in right gluteous, left gluteous, lumber, chest, right eractor, left erector and right trapezious in the local method of operations adopting bending posture. Improved tools and equipments should be introduced for women workers for improving their efficiency or the workers resulting reduction of fatigue and drudgery.*

***Keywords*—** *Transplanting, weeding, harvesting and threshing.*

I. INTRODUCTION

Women have a pivotal role in rice farming. In India, women perform up to 90 per cent of the work in the rice fields. They are involved in planting, transplanting, weeding, harvesting and processing to marketing. Women are doing cleaning of seeds for sowing, nursery sowing, nursery after care, seedling uprooting, Rice-transplanting, weed control (manual), storage, de-husking etc activities alone. Farm women's need for the choice variety is interlinked with their household roles and responsibility of feeding the family and animals. The women not only contribute to crop production process but also in decision making as regard to crop management etc. Hence these are very important to Indian agriculture. Keeping this in view a comparative evaluation was conducted in four selected activities like transplanting, threshing, weeding, harvesting was compared with local method of operation. Fifteen women workers in the age group of 18-45 years were selected. Their physiological parameters were also recorded before conducting the field evaluation work.

II. MATERIALS AND METHODS

Drudgery is generally conceived as physical and mental strain, agony, monotony and hardship experienced by human beings. While all these results in decline in living and working conditions affecting men and women alike, the plight of women in the regard is alarming as they continue to be considered by illiteracy, malnutrition and unemployment . The energy spent by them in performing these tasks is more than it is physically feasible for them to spend particularly in a below subsistence level of living. Women adopt a cropping system with low risk, involving less labour or self dependent, involving crops that are of high value but of non-perishable nature. The operational aspects include field operation, transplanting or sowing, weeding, harvesting, threshing, drying and storage. From the above operations transplanting, weeding, harvesting and threshing which gives more drudgery to farm women.

Fifteen selected subjects came to laboratory every day in the morning after taking breakfast. It was ensured that they had a good sleep in the previous night. It was also ensured that they were free from the influence of stimulants and had no cardiac disease. Prior to the test, their resting heart rate, oxygen consumption rate, blood pressure was measured. Five sub maximal loads (Varying walking speed on treadmill) were applied by means of speed regulator in the treadmill (*Astrand* and *Rodahl*, 1977). This test was conducted on a tread mill and the experiment was conducted at natural.

Environmental condition (29.4 + 2.4^o C and 74% $\pm$ 8.3 R.H) in the ergonomics laboratory in CAET, Bhubaneswar. The experiment was designed as follows.

1. Subjects: Fifteen
2. Slope: One level (at 5%)
3. Speed: Five levels (1.0, 1.5, 2.0, 2.25 and 2.5 km /h)
4. Replication: Three

The anthropometric parameters of selected subjects (N=15) has been placed in table no 2. The total no of 31 parameters of anthropometric and strength data of fifteen women subjects was measured with the help of integrated composite anthrpometer. The mean value of stature, vertical reach, vertical grip reach, acronomial height of Odisha workers was recorded lower than that of Indian agricultural

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worker. Keeping the design parameter into consideration, the 5th, 95th percentile value was also measured .The push and pull strength (both hands) was recorded for ergonomical interventions.

Transplanting: Women uproot the seedlings from the nursery and planting these, only bending throughout the day in water. The drudgery aspect is aggravated when they have to transplant under the sun. Three row rice transplanter (by OUAT) is the better option. Transplanting is an important operation of rice cultivation involving such working in the puddled soil, backward movements and bending. It also offers employment opportunities to women. The wage earner women, got 45-56 per cent employment through transplanting and associated activities out of the total employment the women got in rice cultivation. The older women faced more difficulties in back movement.

Weeding: The weeds are taken out manually by hand adopting either bending or squatting posture. The women have to work in standing water, which may cause skin disease. Rain fed upland crops require more energy and time. Improved tools i. e. Mandwa weeder can reduce the drudgery because the worker has to operate this machine in push-pull mode walking between transplanted rice.

Harvesting and threshing: These are also drudgery prone activities for which efficient drudgery reducing machinery need to be devised. Technologies and tools introduced to communities to improve the productivity on drudgery reduction are based on rural men's needs. The need to develop sustainable technologies that respond to the gender specific needs and to identify the way that aim to improve food security. The daily work responsibilities means heavier taxation of women's energy and labour and less time available for food processing and preparation at home. This may actually lead to increased mal nutrition and deterioration of health.

Fifteen women worker in age groups (18 – 48 years) who were involved in rice cultivation activity were selected purposively for the study. In order to collect the reliable experimental data, the selected subjects were given enough rest before putting them on selected tasks. Kharif season i.e. from July to October was selected for conducting the experiment as it is the season for transplanting rice. Their physiological and anthropometric parameters are presented at table no II and III.

Postural analysis: The discomfort score or various body parts during performing different agricultural activities are measured with the help of figure 1 using a 10 point discomfort scale. It is a pain level scale, zero is no pain, one is a very small amount of discomfort. Two is perhaps a score level of discomfort and ten is the maximum discomfort observed by the worker. (Surabhi Singh *etal.*, 2014)

TABLE I. Overall drudgery status in different activities in rice cultivation selected for ergonomical evaluation.

S. No.	Activities	Overall Drudgery Status	Reasons
1	Transplanting	Heavy	➢ Bending posture ➢ Long hours of standing in deep puddle soil ➢ Discomfort in moving forward and backward in wet field ➢ Care and skill required for uniformity in transplanting
2	Weeding	Medium	➢ Long hours of sitting in wet fields ➢ Requiring different posture in handling traditional implements ➢ Selection of weed plants from cultivated rice variety ➢ Use of blunt and old implements
3	Harvesting	Medium	➢ Bending or sitting on toe ➢ High energy required for harvesting ➢ Injuries while harvesters by traditional sickle ➢ Setting the lodged plants
4	Threshing	Heavy	➢ Bending postures ➢ High energy required for threshing

TABLE II. Physiological parameter of selected subjects (N=15).

S. No	Physiological Parameters	Range	Mean	Standard Deviation
1	Age, Years	15-45	31.1	8.06
2	Weight, Kg	45-59	51.7	4.91
3	Height, cm	142.1-163	152.3	7.61
4	HR_{rest}, beats/min	65-76	70.3	3.17
5	HR_{max}, beats/min	176-200	188.2	7.27
6	$VO_{2\ rest}$, l/min	0.16-0.24	0.19	0.02
7	$VO_{2\ max}$, l/min	1.56-1.81	1.71	0.08
8	BSA, m^2	1.37-1.69	1.52	0.12
9	BMI, Kg/m^2	20.5-23.25	22.31	0.82
10	Expenence, yrs	2-27	18.2	3.5

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TABLE III. Anthropometric measurement of selected subjects.

S. No.	Dimensions	Description	Odisha Data (in cm)			India Data(in cm)		
			Mean	Percentile		Mean	Percentile	
				5th	95th		5th	95th
1	Stature	The vertical distance from the standing surface to the vertex of the head when the subject stands erect and looks straight forward.	151.6	142.1	161.1	152.5	141.4	160.7
2	Vertical reach	The vertical distance from the standing surface to the height of the middle finger when arm hand and fingers are extended vertically	190.1	169	219	192.1	177.8	206.3
3	Vertical grip reach	The vertical distance from the standing surface to the height of the pointer held horizontal to the subjects' first when the arm is maximally extended upward .The subject stands erect and looks straight forward.	179.6	167.1	192	183.1	168.9	197.3
4	Acromial height	The vertical distance from the standing surface to the acromion .The subject stands erect and looks straight forward.	125	116	134	126.1	116.8	135.3
5	Elbow height	The vertical distance from the standing surface to the top of the radial when the subject stands erect and looks straight forward.	96	88.5	103.4	96	88.3	103.7
6	Olecranon height	The vertical distance from the standing surface to the height of the under surface of the elbow, measured with the arm flexed 90^0 and the upper arm vertical. The subject stands erect and looks forward	93.5	86.3	100.8	93.6	86.1	101.1
7	Iliocrystale height(Waist height)	The vertical distance from the standing surface to the top of the iliumin the mid auxiliary plane.	88.2	80.3	96.2	89.6	81.8	97.6
8	Iliospinal height	The vertical distance from the standing surface to the height of the illiospinale.	82.5	75	90	85.3	77.2	93.5
9	Trochanteric height	The vertical distance from the standing surface to the height of the trochanterion	75.9	67.8	84	77.7	67.2	88.2
10	Metacarpal –III height	The vertical distance from the standing surface to the height of the knuckle where the middle finger joins the palm.	64.4	58.6	70.3	64.9	58.1	71.8
11	Knee height	The vertical distance from the standing surface to the midpoint of knee cap	43.7	37.9	49.5	43.8	38.8	48.8
12	Medal malleolus height	The height of the most medially projecting point of the medial ankle bone from the ground surface	6.9	5.3	8.5	7.4	5.6	9.2
13	Waist back length	The vertical distance along the spine from the waist level to the cervical (the tip of the seventh cervical vertebra)	39.9	33.3	46.6	38.2	31.6	44.7
14	Scapula to waist back length	The surface distance from superior angle of scapula to the back at the waist level.	57.5	50.6	64.3	52.7	43.7	61.6
15	Wall to acromion dist.	The distance from the wall to the acromial distance measured with the shoulder against the wall	7.6	5	10.2	9.9	7	12.7
16	Thumb tip reach	The distance from the wall to the tip of the thumb measured with the shoulder against the wall	67.2	57.1	77.3	70.9	63.1	78.7
17	Arm reach from wall	The distance from the wall to the tip of the middle finger measured with subject shoulder against the wall	76	68.8	83.2	77.3	69.8	84.8
18	Shoulder grip length	The horizontal distance from a pointer held in the subjects first to a wall against she stands.	63.0	52.9	73.0	66.4	57.9	74.9
19	Heel breadth	The maximum breadth of the heel as measured below the projection of the ankle bones	5.4	3.8	7.0	5.5	4.3	6.8
20	Wrist circumference	The circumference of the wrist at the level of the tip of the styled process of the radius	15.0	13.2	16.8	14.8	13.0	16.6
21	Hand thickness at metacarpal III	The thickness of the metacarpal phalange joint of the middle finger	3.2	2.0	4.3	2.7	1.8	3.6
22	Maximum grip length	The maximum length between the tip of the index finger and the tip of the thumb while palm , thumb, fingers are in grip position	10.8	8.4	13.3	10.9	8.1	13.8
23	Hand length	The distance from the base of the hand to the top of middle finger measured along long axis of the hand	16.4	14.5	18.2	16.7	15.1	18.2
24	Hand breadth	The breadth of the hand as measured across the distal ends of the metacarpal bones	6.9	5.4	8.4	7.2	6.2	8.3
25	Functional leg length	The distance from the back at the waist level to the heel	91.0	83.4	98.7	93.6	84.8	102.4
26	Push strength (both hands)	The maximum push force applied with both hands on the strength measurement set up with left leg forward	16.1	10.7	21.4	14.3	7.9	20.8
27	Pull strength(both hands)	The maximum pull force applied with both hands on load cell in standing posture	15.9	10.2	21.5	15.8	9.5	22.3
28	Palm length	The distance from the base of the hand to the furrow where the middle finger folds upon the palm	9.3	7.7	10.9	9.4	8.2	10.6
29	Hand breadth across thumb	The breadth of the hand as measured at the level of distal end of the 1st metacarpal of the thumb	8.9	7.2	10.7	8.9	7.6	10.2
30	Vertical grip reach sitting	The height above the sitting surface of a pointer held horizontal in subjects' first when arm is maximally extended upward.	107.5	98.4	116.7	109.2	99.4	119.0

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TABLE IV. Specification of improved implements.

S. No.	Parameters	3 Row Rice Transplanter (OUAT)	Mandwa Weeder	Improved Sickle	Pedal Operated Thresher (OUAT)
1	Dimensions (LXWXH), mm	600X600X940	1560X150X1100	260X12.5	700X950X730
2	Weight, Kg	18	4.82	0.19	40
3	Field capacity	0.01 ha/h	200 m^2/h	110m^2/h	38 kg/h
4	Cost (Rs.)	Rs. 8500/-	Rs. 1600/-	Rs. 140/-	Rs. 6000/-

TABLE V. Ergonomical evaluation of improved implements.

Ergonomical Parameters	Transplanting		Weeding		Harvesting		Threshing	
	Local Manual Transplanting	3- Row Rice Transplanter	Manual Weeding	Mandua Weeder	Local Sickle	Improved Sickel	Beating on Bundles	Pedal Operated Thresher
WHR , beats/min	114.5	126.5	109.8	122.8	117.8	120.4	146.8	128.9
HR, beats/min	44.2	54.9	39.3	52.6	46.3	48.8	76.3	58.8
VO_{2work} , l/min	0.58	0.91	0.36	0.88	0.43	0.48	1.18	0.91
RCWL , % of VO_{2max}	32	50.3	19.8	48.6	23.7	26.5	65.2	50.3
EER, kJ/min	12.1	19.0	7.5	18.4	8.98	10.03	24.7	19.1
ODR(10 point scale)	4.5	5.5	3.5	5.5	3.5	3.5	8.5	6.5
$BP_{systolic,}$ mmHg	119.3	124.6	116.3	121.8	117.3	120.4	128.3	122.3
$BP_{diastolic,}$ mmHg	79.1	82.6	78.6	81.3	80.2	81.6	82.3	81.8
Area covered , m^2	75m^2	165 m^2	60 m^2	200 m^2	60 m^2	95 m^2	22 kg/hr	40 kg/hr
Man days/ha	53.3	24.3	66	20	666	42.3	-	-

TABLE VI. Postural analysis of selected subjects during different activities.

S. No.	Body parts	Discomfort mean Score (10 point scale)							
		Local Transplanting	Three Row Rice Transplanter	Manual Weeding	Mandua Weeder	Local Sickel	Improved Sickel	Beating by Bundles	Pedal Operated Thresher
1	Head	7.5	4.2	5.5	5.5	5.3	5.3	5.6	5.3
2	Left Shoulder	3.8	4.5	7.2	7.9	7.2	7.2	7.9	7.9
3	Right Shoulder	5.6	4.8	7.8	7.9	7.1	7.1	8.5	7.3
4	Chest	8.3	3.6	7.1	5.5	5.3	5.3	6.3	5.6
5	Right Upper arm	6.2	6.8	6.9	8.1	7.1	7.1	8.6	7.1
6	Left Upper arm	5.3	6.3	6.7	8.1	6.5	6.5	7.1	7.9
7	Abdomen	7.3	3.8	6.5	3.7	6.0	6.0	5.3	5.3
8	Left foremen	4.4	6.3	6.3	5.1	6.5	6.5	7.1	7.9
9	Right Foremen	5.3	3.8	6.2	5.1	7.2	7.2	6.9	7.2
10	Left Wrist	4.3	3.5	7.2	7.9	6.5	6.5	6.5	6.5
11	Right Wrist	5.1	3.8	6.9	7.9	7.3	7.3	6.9	6.2
12	Left Thigh	5.2	4.8	7.5	5.3	6.9	6.9	7.1	7.1
13	Right Thigh	5.3	4.7	7.5	5.3	7.8	7.8	7.5	8.9
14	Left Knee	5.5	4.3	7.3	5.6	7.2	7.2	7.1	7.2
15	Right Knee	5.6	4.7	7.3	5.6	7.5	7.5	7.5	8.9
16	Left Foot	7.3	7.2	7.1	7.2	6.8	6.8	7.1	7.3
17	Right Foot	7.4	7.3	7.1	7.2	6.8	6.8	7.4	8.8
18	Neck	7.3	3.8	5.6	5.1	7.0	7.0	4.9	5.3
19	Right Trapezious	8.2	5.2	6.3	5.0	5.3	5.3	4.3	5.9
20	Left Trapezious	7.1	5.3	6.3	5.0	5.3	5.3	4.3	5.9
21	Thoracic	7.5	3.8	7.2	3.8	6.8	6.8	6.8	6.2
22	Right Erector	8.2	4.6	7.1	4.2	6.3	6.3	6.8	6.3
23	Left Erector	8.1	4.2	7.1	4.2	6.3	6.3	6.8	6.5
24	Right Elbow	5.5	6.8	7.3	7.2	7.5	7.5	7.5	6.3
25	Left Elbow	4.8	6.3	7.0	7.2	7.2	7.2	7.2	7.2
26	Lumbor	8.6	4.3	6.9	4.5	6.3	6.3	6.5	6.9
27	Right Gluteous	8.8	4.6	8.1	4.2	4.8	4.8	6.2	6.9
28	Left Gluteous	8.3	4.7	8.2	4.2	4.8	4.8	6.2	6.9
29	Right Hip	7.2	3.8	8.0	3.9	4.8	4.8	6.5	6.9

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30	Left Hip	7.3	3.7	8.0	3.9	4.8	4.8	6.5	6.9
31	Right Hand	7.2	4.8	8.1	7.1	7.8	7.8	8.1	7.1
32	Left Hand	5.3	4.6	7.9	7.1	7.5	7.5	7.9	7.9
33	Right Lower leg	5.7	4.2	7.6	6.9	7.0	7.0	7.1	8.9
34	Left Lower Leg	5.8	3.8	7.5	6.9	6.8	6.8	7.0	7.1

Fig. 1. Body parts discomfort score.

III. Result and Discussion

The physiological parameters of the selected subjects are also presented in table no II. The age of worker varied in the range of 15-45 years with mean value 31.1+8.06 years. The mean value of weight was recorded 51.7 Kg which is at par Odisha data. The mean HR_{rest} and mean $VO_{2\ rest}$ of the subjects observed to be 70.3 beats/min and 0.19 l/min respectively. Similarly the mean value of BSA and BMI are 1.46 m^2 and 22.3 kg / m^2 respectively.

The maximum heart rate of women workers varied in the range of 1.56 to 1.8 l/min with a mean and standard deviation value of 1.71 ± 0.08 l/min .It is generally observed that with increase in age of the workers the $VO_{2\ max}$ of Indian female subjects were also reported earlier (Nag *etal.*, 1988, Gite, 1996, Vidu, 2001, Jena and Mohanty, 2014). The mean body mass index (BMI) was calculated to be 22.31 Kg/m^2 with the range of 20.5 to 23.25 Kg/m^2 indicated that all the women subjects were in normal health as per the classification given by Garrow, 1987. The ergonomic evaluation of four different operations i.e transplanting, weeding, harvesting ,threshing has been compiled in table no V.These four operations has been selected on the basis of involvement of women workers in agricultural activities in Odisha. The manual transplanting compared with OUAT developed three row rice transplanter which is operated in standing posture in push-pull mode. In transplanting adopting bending posture , the women worker has to bend 90^0-105^0 which is drudgery prone and increases musculoskeletal disorders. The working heart rate (WHR) was recorded 114.5 beats/min during manual transplanting using polar heart rate monitor with change in heart rate (ΔHR) 42 beats/min. The relative oxygen consumption rate (OCR) was measured 0.58l/min and it is operated at RCWL 32.0 per cent of the $VO_{2max.}$ The corresponding energy expenditure rate (EER) was observed to be 12.1 kJ/min. The systolic and diastolic blood pressure were found to be 119.3mmHg, 91.1 mmHg respectively while compared with transplanting value of three row rice transplanter. The WHR and ΔHR was recorded 26.5 and 54.9 beats/min. The OCR during work was recorded 0.91 and RCWL was observed to be 5.2 per cent of VO_{2max}. Higher energy expenditure rate was observed to be 19.0 respectively. The systolic and diastolic blood pressure 124.6 and 82.6 mmHg was recorded with the help of Sphygmomanometer. The average transplanting area in case of three row transplanter was recorded 165 m^2 against 75m^2 in case of manual local method of transplanting. In manual transplanting, 24.3 man hours / Acre is required against 53.3

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man hours/ Acre. Similar results have also been recorded by Jena and Mohanty, 2014.

While manual transplanting, the energy expenditure rate was recoded 7.5 kJ/min which was increased to 18.4 kJ/min while operated Mandwa weeder. The systolic and diastolic blood pressure were recorded 121.8 and 81.3 mmHg while operating by Mandwa weeder. The average weeding area in case of Mandwa weeder was recorded 200 m^2 against 60 m^2 in case of manual weeding in improved rice transplanter. 20 man-hours/acre is required against 66 man-hours/acre in case of manual transplanting. By adopting improved sickle, the relative cost of work load was recorded 23.7 per cent in case of local sickle against 26.5 per cent in improved sickle. The area covered in case of improved sickle was recorded 95 m^2 against 60 m^2 in case of local sickle. 42.3 man-hours/acre is required against 66.6 man-hours/acre in case of local sickle. In case of threshing operation, the EER was recorded 24.7 kJ/min while threshing done by beating by bundles but it was reduced to 19.1 kJ/min while threshing done by pedal operated thresher. The systolic and diastolic blood pressure was recorded 122.3 and 81.8 mmHg while operated by pedal operated paddy thresher respectively. The threshing capacity was increased from 22kg/h to 40kg/h respectively from beating by bundles to pedal operated thresher. It was also found that extended working hours may have an impact on fatigue, health and well being of the women workers.

Discomfort level of farm women during different types of operations of different activities was recorded by means of a 10 point scale, '0' is no pain, '1' is very small and '10' is the maximum discomfort level. Body parts discomfort scale is a subjective symptoms survey tool that evaluate the respondents direct experiencing with the discomfort of pain .Pain has both physical and emotional components. In table no VI, thirty four (34) body parts have been categorized in discomfort mean score of fifteen women subjects in different operations like transplanting, weeding, harvesting and threshing. They have been surveyed through a participatory approach. During manual transplanting in bending posture, higher discomfort score was reported in right gluteus (8.8), left gluteus (8.3), lumbor (8.6), chest (8.3), right eractor (8.2), left eractor (8.1), right trapezius (8.2). This may be due to the reason that, the worker has to bend 90^0 to 105^0 and work continuously for 5 to 6 hours during transplanting season. When the women worker transplanted with 3 row manual transplanter, the bending posture is avoided resulting lower discomfort score as compared to manual method of transplanting. Similar results have also been recorded in manual weeding. During this weeding, higher discomfort score was reported in right gluteous (8.1), left gluteous (8.2), right hip (8.0), left hip (8.0), right hand (8.1), left hand (7.9) and right shoulder (7.8). This may be due to the fact that the worker had to adopt sitting in squatting posture for 4 to 5 hours. When the worker used mandwa weeder, the squatting posture is avoided resulting lower discomfort mean score as compared to manual method of weeding. During harvesting with local sickel, higher discomfort score was reported in left shoulder (7.2), right shoulder (7.1), right upper arm (7.1), left knee (7.2), right knee (7.5), right elbow (7.5) and left elbow (7.2). With improved the discomfort score as compared to local sickle reduces the chances of hand injury and it also increases the efficiency of worker. In threshing by beating of bundles, higher dicomfort score was observed in left shoulder (7.9), right shoulder (8.5) ,right upper arm (8.6), left hand (7.9), right hand (8.1). But when the women worker adopted pedal operated thresher the discomfort score was minimised.

IV. Conclusion

Women play a major role in agricultural activities in all parts of India It is presumed that the percentage of women worker will be 52 per cent of total work force during 2015. The drudgery of women worker needs to be taken care off. Keeping this in view the four major drudgerious activities like transplanting, weeding, harvesting and threshing were evaluated with the help of women workers. The bending posture is mostly adopted for these operations could be avoided simply by introducing improved equipments. The efficiency of these equipments were recorded more that of local method of operations. The drudgery and fatigue faced by the women workers are reduced. Proper training and demonstration programme could be organised for increasing efficiency and reducing physical strain of the women worker.

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