

Ergonomic Constraints Analysis of Women Agricultural Labourers Engaged In Fodder Collection -A Haryanastudy

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ABSTRACT: Most of the animal husbandry activities, viz. fodder collection, cutting, milking, etc. are more or less farmwomen's responsibility in most parts of India, especially Haryana. An ergonomic study was undertaken to determine the physiological and biomechanical stress of women engaged in fodder collection in Mewat region of Haryana. Data was collected from 100 women to elicit information regarding their participation in various animal husbandry operations. The field experiment was carried out for one hour on 40 farmwomen belonging to two age groups, viz. 25-35 yrs and 35-45 yrs. Findings revealed that cent percent women were agricultural labourers having family income up to Rs. 5000 per month, possessing 1-5 animals, belonging to nuclear family (65.00 %) with a family size of 5-7 member (52.00 %). They were mainly engaged in animal husbandry to meet out the family requirements and supplement family income. Farmwomen collected 30-35 kg of fodder per day, travelling a distance of 2-3 km, spending up to 3-4 hours per day in collection of fodder. Average working heart rate of women increased up to 112.3 beats per minute and 115.8 beats per minute in the two age groups, respectively. Energy expenditure was more in older (9.69 kJ/min) than younger group (9.13 kJ/min). Women perceived heavy exertion after the activity as it was performed under the scorching temperatures ranging between 43-45°C in the month of May and June. Since fodder collection is performed throughout the year, women have to face adversity of weather conditions, especially during peak summer and winter season. Besides, these women were agricultural labourers and had to perform various arduous farm activities like wheat, rice and bajra harvesting, rice transplanting, interculturing of crops, cotton picking, etc. adopting unnatural body postures requiring frequent bending from the waist. Various types of musculo-skeletal discomforts were reported by women especially in the lower and upper back, wrists and thighs, etc. They tied *jholis* (makeshift bags made from a cloth) to their shoulders and back to collect fodder and emptied them after filling 5-6 kg of load resulting in severe discomfort in neck. The findings of the study suggest that there is an urgent need to reduce drudgery of women in various farm activities including fodder collection. Means are required to be devised so that the farmwomen do not suffer from vertebral column related injuries and pain on account of carrying continuous load on their head and back. The study warrants an urgent need for promotion of training programmes in villages for addressing the issues of musculo-skeletal problems of women with emphasis on maintaining proper posture during fodder collection and other farm oriented activities. Promotion of improved sickle, especially designed for women, would be an important tool in hand to reduce drudgery of farmwomen.

KEYWORDS: Fodder collection, women, physiological constraints

I. INTRODUCTION

Women play a significant and crucial role in agricultural development and allied fields main crop production, livestock production, horticulture, post-harvest operations, agro/social forestry, fisheries, etc. in India, especially Haryana. The nature and extent of women's involvement in agriculture, no doubt, varies greatly from region to region. Even within a region, their involvement varies widely among different ecological sub-zones, farming systems, castes, classes and stages in the family cycle. From household to farm and family maintenance activities, to transporting water, fuel and fodder are all women oriented activities performed under unnatural body postures which add more burden to them. Livestock is the primary subsistent activity used to meet household food needs as well as supplement farm incomes. Mostly women are engaged in cleaning of animals, sheds, watering and milking the animals. Rural women are also involved in preparing dung cakes, an activity that also brings additional income to poor families. Evidently, rural

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women are involved in almost all livestock related activities except grazing. Keeping milch animals is an important source of income for poor farm families and agricultural labourers.

The agro-climatic conditions make Mewat region in Haryana more resource poor leading to subsistence farming, limited alternative livelihood options and hence poverty. Mewat district ranks lowest in the state of Haryana on most development indicators. It is home to nearly one million people, 95% of whom live in rural areas and the majority of whom depend on agriculture [1]. The female to male sex ratio is 893:1000, lower than the national average of 927:1000. The literacy rates by gender are indicative of unequal gender representations with only 24.26% females in Mewat being literate compared to 61.53% males.

There are several studies revealing active participation of farm women in animal husbandry activities but there is hardly any literature that reveals the physiological workload and biomechanical stress of women while performing the activity. During the activity, they adopt unnatural body posture due to which their physiological workload increases and also they face many types of musculo-skeletal problems. As a result, the efficiency of women for working decreases to a large extent. Therefore, it is important to introduce new training programmes and technologies that can reduce the drudgery of women, thereby, raising the quality of their life. Keeping these factors in view, the present study was planned with two specific objectives: (1) Assessment of nature and extent of participation of landless rural women in animal husbandry activities and (2) Ascertaining physiological stress of women in fodder collection activity.

II. RELATED WORK

Time spent pattern of the tribal women in various animal husbandry operations in descending order were found to be preparing feed for animals (29.33 minutes), providing water to the animals (21.24 minutes), cleaning animal shed (20.42 minutes), grazing animals (19.28 minutes), milking (18.06 minutes), cutting and bringing fodder (16.39 minutes). The study revealed that most of the animal husbandry operations were female dominated as compared to their male partners. Regression analysis proved that family educational status, flock size (sheep/goat) and age of the tribal women were highly correlated with time spent on animal husbandry operation [2].

Mostly women are engaged in cleaning of animals, sheds, watering and milking the animals. Rural women are also responsible for collection, preparing dung cakes, an activity that also brings additional income to poor families. Evidently, rural women are involved in almost all livestock related activities. Except grazing, all other livestock management activities are predominantly performed by females. Majority of women are involved in shed cleaning and collection of farm yard manure. Males, however, share the responsibility of taking care of sick animals. It is evident that the women are playing a dominant role in the livestock production and management activities [3].

Dairying in India is a female dominated enterprise. It is established beyond doubt that women always participate in dairy and animal husbandry activities in addition to their daily household chores. Women spent more time than men in dairy production activities. Training is one of the important aspects of empowerment, which can enhance knowledge, improve skill and change the attitude of rural women. Selection of breed, compounding balanced feed using locally available ingredients, feeding during pregnancy, health care and banking and insurance were the most preferred areas of training in dairy farming. The overall adoption level of the trained dairy farm women was higher than untrained dairy farm women [4].

III. METHODOLOGY

The study was conducted in two phases viz;

Phase 1: Nature and extent of participation.

Phase 2: Assessment of physiological and biomechanical workload.

Phase 1: Nature and extent of participation: Involvement pattern in various animal husbandry activities, time spent, implement used and weight of fodder carried by women were studied on 100 rural landless agriculture workers engaged in animal husbandry activities.

Phase 2: Assessment of physiological and biomechanical workload: The study was carried out on 40-farm women involved in fodder collection activity and constituting two age groups viz., 25-35 and 35-45 years (20 each). The field

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experiment was conducted in the month of May-June for fodder collection activity. During the experiment, various parameters viz. socio-economic profile, extent of participation and physiological workload were assessed.

Body Mass Index (BMI): Body Mass Index was derived by measuring weight and height of the woman using Quetelet Index in the following formula and the grading of the respondents has been done as given [5].

$$Q.I. = \frac{Weight (kg)}{Height^2 (m)}$$

Body type as per BMI according to Quetelet's Index is graded as ectomorph, mesomorph and endomorph.

Assessment of Ergonomic parameters: Ergonomic assessment consisted of time and activity profile, physiological workload and biomechanical stress.

Time and activity profile

Stopwatch was used for recording time and pedometer was used for measuring the distance traveled.

Physiological workload: It refers to the "physical or muscular effort required on the part of the worker to accomplish a task or an activity. The period during which the work continues is known as work period and period during which the physiological functions return to resting level is known as recovery period. Hence, to evaluate total physiological expenditure, physiological reactions both during the work & during the recovery period are considered. Hence, HR was recorded using polar heart rate monitor firstly at rest & then after every minute for 30 minutes during the experiment till the recovery of the subject. HR was also recorded at the end of the activity.

Energy Expenditure: Energy expenditure during work was also calculated by AHR by using the regression equation [6]:

$$\text{Energy expenditure (KJ/min)} = 1.59 \times \text{Avg Working HR (bpm)} - 8.72.$$

Rating of perceived Exertion- Though HR is widely used parameter to estimate physical workload yet it is difficult to measure it for the short duration tasks. Hence subjective perceptions of exertion of the subjects known as Rating of perceived exertion (RPE) was determined [6] on a 5 point continuum ranging from very light exertion (1) to very heavy exertion (5). Mean was calculated for all the subjects to get an average score.

Musculo-skeletal problems: Incidence of musculo-skeletal problems were identified using body map indicating different parts of the body after completion of activity. Five point scale was used to record the intensity of pain in various body parts viz., 5, 4, 3, 2, 1 for intensity of pain as very severe, severe, moderate, light and very light [7].

IV. RESULTS

Results pertaining to the socio-economic profile, i.e. age, education, marital status, family type, family size, monthly family income and nature and extent of participation of rural women in animal husbandry activities were as follows:

Table1. Personal profile of the respondents

n=100			
Sr. No.	Variables	Frequency	Percentage
1.	Age		
	Up to 25 years	17	17.00
	26-35 years	58	58.00
	36-45 years	25	25.00
2.	Education		
	Illiterate	67	67.00
	Primary	23	23.00
	Middle	08	08.00
	Matric	02	02.00
	Sr. Secondary	-	-
	Graduate	-	-
3.	Marital status		

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	Married	86	86.00
	Unmarried	14	14.00
4.	Family type		
	Nuclear	65	65.00
	Joint	35	35.00
5.	Family size		
	Up to 4 members	25	25.00
	5-7 members	52	52.00
	above 7 members	23	23.00
6.	Monthly family income (Rs)		
	UptoRs 5000	82	82.00
	Rs 5000-10,000	16	16.00



	Above Rs 10,000	02	02.00
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Data in Table 1 reveal that majority of respondents engaged in fodder collection belonged to 26-35 years of age (58%), followed by those who were between 36-45 years of age (25%) and upto 25 years of age (17%). About two-third of them were illiterate (67%) followed by those who were educated upto primary level (23%) and middle (8%). None of them had studied upto senior secondary level or graduation and the highest education obtained by them was matriculation (2%). Overwhelming majority engaged in fodder collection was married (86%), belonged to nuclear family type (65%), had family size between 5-7 members (52%). Majority (82%) of respondents had monthly income uptoRs 5000 (82%) followed by those having income between Rs 5,000-10,000 (16%). Negligible percentage had family income above Rs 10,000 (2%).

Table 2. Extent of participation of rural women in animal husbandry activities

n=100

Sr. No.	Activity	Participation(%age)	Time spent(min/day)
1.	Fodder collection and bringing	100.00	168
2.	Feeding and watering animals	79.00	25
3.	Milking	63.00	17
4.	Processing of milk	93.00	22
5.	Cleaning of cattle shed	81.00	19
6.	Collecting and making cow dung cakes	89.00	27
7.	Preparation of feed	80.00	45
8.	Bathing animals	65.00	20
9.	Delivery of milk	27.00	13

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Perusal of data in Table 2 revealed that cent percent women were engaged in fodder collection and bringing fodder. Majority of women were performing various animal husbandry activities viz; processing of milk (93.00%), collecting and making cow dung cakes (89.00%), preparation of feed (80.00 %) and feeding and watering animals (79.00%). Fodder collection and bringing was found to be the most time consuming activity (168 min/day). A study revealed that as regards animal husbandry activities, procurement of fodder, chaffing of fodder and cleaning of cattle shed were found to be highly drudgerous activities [8]. Another study revealed that maximum number of women were involved in collecting dung (73.0%), cleaning cattle shed (72.5%), feeding animals(71.0%), spending maximum time in a day on fodder collection(118 min.) feeding animals (54 min.) and collecting dung and making dung cakes (42 min.) [9]. On drudgery index, fodder collection was reported to be the most drudgerous activity followed by feeding animals and preparing dung cakes. In a survey conducted among the beneficiaries revealed that average time taken by women farmers for collection of fodder required per day's feeding was 177.83 minutes before start of the project, which was reduced by 75 percent after inception of the project to 43 minutes. Sixteen percent of the farmers had to spend more than 6 hour each day for collection of fodder required to feed their animals before the inception of the project. Cent percent of the women beneficiaries opined that fodder cultivation had reduced their drudgery involved in animal husbandry activities. Earlier women farmers in the region had to walk 4-5 kilometers daily to get sufficient green and brought it by head loads. Fodder cultivation had substantially reduced their hardship as they need not walk long distances. Average milk production in the project area had increased by nearly 2 liters per animal [10].

Table 3 Training need requirement for animal husbandry activities
n=100

Caring of diseased animals	I
Preparation of feed concentrate	II
Breeding of animals	III
Feeding and watering of animals	IV
Construction of animal sheds	V
Cleaning and maintenance of animals	VI

Perusal of data in Table 3enlists the preference of the respondents regarding the training needs related to animal husbandry which can be imparted to them by field functionaries or extension specialists of state government and agricultural universities, etc. Caring of diseased animals topped the list (rank I), followed by preparation of feed concentrate (rank II), training on knowledge about breeding of animals (rank III) and feeding and watering of animals (rank IV). Training is one of the important aspects of women empowerment by enhancing knowledge, improving skill and changing attitudes of women to adopt modern techniques and tools for animal husbandry activities. Training is meaningful only if it is need-based and brings attitudinal change to establish own enterprise. Evaluation of training programme helps in assessing gain in knowledge, skill and satisfaction due to training. Reactions of participants can be known, usefulness of methods and approaches used can be assessed [11]. Education and training are not just about developing human capital – someone's knowledge, skills and competences [12] but they are also a tool to develop social, cultural and identity capital as well.

Physiological workload analysis

Physiological stress of women engaged in fodder collection was determined on the basis of various parameters like physical characteristics, average heart rate, energy expenditure, rating of perceived exertion (RPE) and classification of workload while performing the fodder collection activity.

Physical characteristics: Mean age of the respondents engaged in fodder collection was 34.8 years, measuring body height of 158.9 cm and body weight as 49.2 kg. Lean body mass was measured to be 26.6 kg., while body mass index was 19.4kg/ m². Two third women (70%) were having ectomorph body type followed by mesomorphs (20%) and endomorphs (10%)(Table4).

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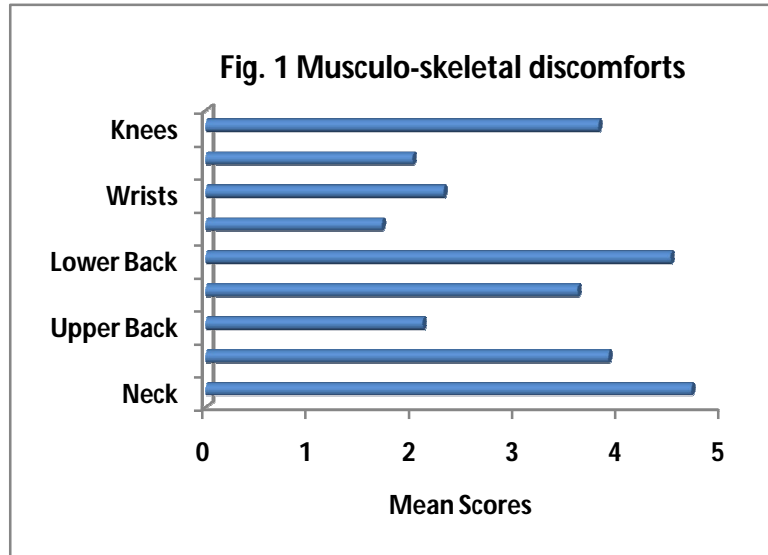
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Table4: Physical characteristics of selected respondents

Variable	25-35 years (n=20)	35-45 years (n=20)	Total
	Mean	Mean	
Age (years)	29.3	40.3	34.8
Height (cm)	158.7	159.2	158.9
Weight (kg)	48.3	50.2	49.2
Lean body mass (kg)	25.7	27.5	26.6
Body mass index (kg/m ²)	19.1	19.8	19.4

Table 5: Time and activity profile of selected respondents for fodder collection activity for one day

Sr. No.	Parameter	Age group		Total
		25-35	35-45	
1	Type of implement used for performing the activity	Traditional sickle	Traditional sickle	Traditional sickle
2	Total time spent on fodder collection (min/day)	159	177	168
3	Distance traveled (km) <ul style="list-style-type: none"> • Onward journey • Fodder cutting • Backward journey 	2.25 0.49 2.25	2.78 0.61 2.78	2.51 0.55 2.51
4	Total distance traveled (Km)	4.99	6.17	5.58
5	Average weight of collected fodder (Kg)	34.2	32.8	33.5
6	Average temp. during activity(°C)	42.1	42.1	42.1
7	Average heart rate (bpm)	112.3	115.8	114.1
8	Energy expenditure (kjmin ⁻¹)	9.13	9.69	9.42
9	Rating of perceived exertion	3.5	3.7	3.6
10	Classification of workload	Moderately heavy	Moderately heavy	Moderately heavy



Data indicates that majority possess 3-5 big and small animals. They collected an average of 33.5 Kg fodder every day, travelled a distance of 5.58 Km on an average and during summer worked in a scorching heat with average temperature of 42.1°C. All the respondents used traditional sickle for cutting fodder. Among animal husbandry activities, procurement of fodder, chaffing of fodder and cleaning of cattle shed were highly drudgery prone activities [8]. Data further indicate that average heart rate was observed to be 112.3 beats per minute among women belonging to 25-35 years of age while it was found to be 115.8 beats per minute among older women. Similarly, energy expenditure was measured to be 9.13 kJmin⁻¹ and 9.69 kJmin⁻¹ in the respective age groups. The mean score for Rating of perceived exertion was found to be 3.6. Workload of women in both the age groups was determined to be moderately heavy. (Table 4)

Musculo-skeletal problems: It is a well-known fact that working in a particular posture for longer duration causes fatigue and maintaining the same posture beyond certain limit of time for years causes musculoskeletal disorders in the body. As a result, the working efficiency of the workers is greatly reduced. Working in bending posture for longer periods might be the reason that almost all the women reported severe to moderate discomfort in neck (mean score 4.7), lower back (4.5), knees (3.8), shoulders (3.9), upper arm (3.6), wrists (2.3) and upper back (2.1) (Fig. 1).

V. CONCLUSIONS

Use of inappropriate tools along with arduous body postures adopted by women during various animal husbandry activities contribute to drudgery of women. Women reported very severe pain in neck (4.7) as a result of carrying heavy load (33.5 kg) everyday on their heads while travelling a distance of approximately 2-3km/day on their return journey. Very severe pain was also reported in lower back (4.5) due to the squatting and bending posture adopted by them during fodder collection activity. As all the women were landless laborers, they usually had to travel long distance in search of fodder, especially during the summer months with high temperature ranging from 40-43°C further adding to their misery. Women usually finished their household chores before going for fodder collection as they were uncertain about the time it would take and distance they would have to travel to collect fodder. Landowners at times did not allow them to collect grass around their fields because of fear of damage to their crops or apprehension of theft from their field. All the respondents used traditional sickle for cutting fodder. During fodder collection, women usually adopted bending posture and continued to work in that posture for long durations without changing the posture, thereby leading to severe pain in lower back and knees. In view of this scenario, need is felt for organization of periodic training programs to create awareness among women workers and educate them regarding adopting appropriate postures and taking adequate pauses while performing agricultural activities. It may not be out of place to mention here that considering their dual responsibilities within and outside the home, it would be in the fitness of things that such training programmes are organized to suit their convenience. In order that farmwomen get a fair deal at the hands of

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change agents, it would be advisable to induct a sizeable number of well-trained women personnel in training and extension programmes of agricultural development agencies at all levels and more so at the grass-root level.

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