Range Mgmt. & Agroforestry 32 (2) : 124-130, 2011
ISSN 0971-2070

Role of farmwomen in forage based livestock production system in north-western Himalaya

Inder Dev, S. Radotra, J. P. Singh[1], M. S. Pathania[2] and S. Sareen[3]
Hilly Regional Research Station, Indian Grassland & Fodder Research Institute, Palampur (H.P). India.
[1]Indian Grassland & Fodder Research Institute, Jhansi (U.P.). India.
[2]Department of Agricultural Economics, HPKV, Palampur (H.P) India
[3]Present address: Directorate of Wheat Research, Karnal (Haryana), India
Corresponding author e-mail: drinderdev@yahoo.co.uk
Received: 29th July, 2011 Accepted: 1st December, 2011

Abstract
The main source of income and livelihood support to resource poor farmwomen in north-western Himalayan region is livestock-based agricultural activities. Activity analysis showed that 78% of the farmwomen were engaged in domestic activities followed by service (14%) and business (8%). The farmwomen spent about 4 hrs (<25 years), 5.04 hrs (25-50 yrs) and 4 hrs/day (>50 yrs) on animal husbandry activities indicating that middle age group of farmwomen spent more time on different animal husbandry activities. In animal husbandry activities, most of the time was spent on collection and feeding of fodder as they had to travel long distance for collection from grasslands followed by tending of the animals for grazing. Despite their substantial time contributions, women did not often have a say in important decisions within the household, especially in financial matters. Participation of rural farmwomen in decision making process in livestock rearing activities increased with their age. The benefit of their rich experience and age was thus fully utilized in taking decisions. The actual area under productive grassland /pasturelands is only 16.53 *per cent* of the total geographical area of Himachal Pradesh. The productivity of these grasslands is 4.82 t green and 1.65 t dry/ha. The grazing pressure has been estimated as 4.98, 7.86, 2.64 and 0.10 ACU/ ha of grasslands in Bilaspur, Kangra, Kullu and Lahaul-Spiti districts respectively, showing an alarming burden on farmwomen to feed their livestock.

Key words: Education, Farmwomen, Forage, Gender, Grassland, Hill farming, Household activities, Livestock

Introduction
Rural women are the backbone of agricultural activities including livestock and thereby play an important role in food security and provide crucial support for family (Sharma *et al.*, 2011). It is estimated that women are responsible for 70% of actual farm work and constitute upto 60% of the farming population (Chayal and Dhaka, 2010). Although their work contribute significantly to household income, many of the agricultural activities that women perform go without any direct financial earnings, so the rural women are sometimes referred to as "invisible farmers" (Shiyani and Vekariya, 2000). The greater participation of farmwomen in livestock and agricultural activities clearly indicates that they are significantly contributing to household income. However, the role of women in economic and social development has not received due recognition so far in our society. Age and education are the main factors, which affect the participation and role of farmwomen in decision making.

Animal husbandry is an important vocation for the people of the Himachal Pradesh. The state has a cattle population matching that of the human population and almost every family rears livestock. The predominantly rural population of the state is primarily dependent on agriculture based economy for livelihood. More than 80% of land holdings in the state are marginal. It is not preferred to set aside agriculture land for raising fodder crops and, therefore, the livestock is mainly dependent upon the natural grazing resources. Buffaloes, sheep and goats kept by the tribal communities of the state are traditionally subjected to transhumance every year for sustenance. People are also dependent on the forests for their fuel wood, timber and fodder requirements. It is important to recognize the contribution and role of farmwomen in various livestock rearing activities. Timely, reliable and periodical information base on grazing and other feed resources is essential for assessment of the role of rural farmwomen in forage based livestock production system in north-western Himalaya. Therefore the study was undertaken to understand the participation of rural farmwomen in various activities

including the livestock rearing activities and to estimate the forage requirement and availability in the study area.

Materials and Methods

The present study was carried out in four geo- climatic zones of Himachal Pradesh (Singh *et al,* 2009). IRSP6L3 data set was used for the identification, characterization, forage production and forage demand – supply balance sheet. Multistage stratified random sampling technique with district as the 1st stage and farmers as the final stage of the selection was adopted. Total 4 district from different geo-climatic zones, *i.e.*, Bilaspur (zone-I), Kangra (zone –II), Kullu (zone-III) and Lahaul & Spiti (zone-IV) were selected. Further two blocks were randomly selected from each district. Two *Patwar* circles (Revenue villages) were randomly selected from each selected block. Two villages were selected from the each of 2 *Patwar* circle from each of 2 blocks. The households selected from each village were divided into two categories *viz.*, marginal (land holdings less than 0.70 hectare) and small (land holdings more than 0.70 hectare) by using cube root frequency method. In total, 200 sample households belonging to marginal (132) and small (68) categories were selected from 32 villages through probability proportional allocation method. The PRAs and key informant interviews techniques were undertaken to understand the socio-economic profile and livestock rearing, household and agricultural activities performed by rural women. The livestock population was converted into standard cattle unit by conversion factor as suggested by Kumbhore *et. al.* (1983). Cobb-Douglas function (regression analysis) of following type was used to quantify the factors affecting the income of women generated from time spent on different activities. $Y= b_0 X_1^{b1} X_2^{b2}$ Where, Y= Income of women from time spent on different activities, X_1 = Age, X2 = Education, $b_{0=}$ Constant, b_1 and b2 = Regression coefficients.

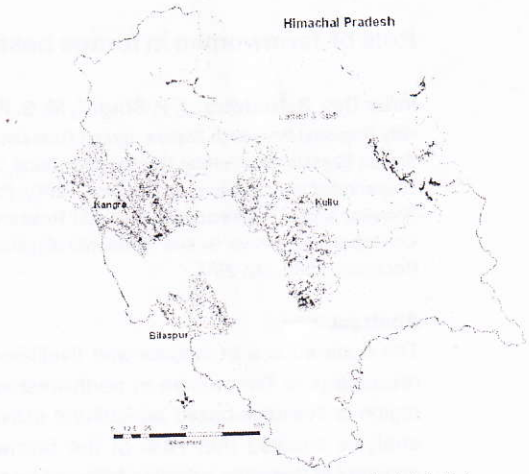

Fig. 1. Spatial distribution of grasslands in selected districts

Results and Discussion

***Forage production from natural grasslands in selected districts*:** The total area available for animal grazing in the state is 33.34 *per cent* (Anonymous, 2004) but, based on the recent satellite data analysis, the actual area under productive grassland /pasturelands is only 16.53 *per cent* (Fig.1) of the total geographical area of Himachal Pradesh. The productivity of these grasslands was assessed to be 4.82 t green and 1.65 t dry/ha. The extant, condition and production potential of grasslands varied in different geo-climatic zones. Based on IRSP6LISS3 imagery, the area under grasslands was found to be 26.14, 12.38, 12.10 and 15.43 percent in Bilaspur, Kangra, Kullu and Lahaul & Spiti districts, respectively (Table 1). These pastureland provide only 7.5, 8.54 and 23.20 percent of total forage requirements of livestock in Bilaspur, Kangra and Kullu district. Rest of the forage requirement was met out from crop residues and grazing from other fallow/ forest/ uncultivated lands.

Table 1. Area under grasslands (based on IRSP6 LISS3 B4 imagery) and forage requirement and availability

District	Geographical Area (000'ha)	Grasslands (000'ha)	Grass-lands (%)	Livestock (ACU)	ACU /ha Land	ACU / ha Grass-lands	Forage (000't/year) Require-ments	Forage (000't/year) Availa-bility	Forage supply* (%)
Bilaspur	115.59	30.21	26.14	150457	1.30	4.98	555	42	7.50
Kangra	563.83	69.78	12.38	548355	0.97	7.86	2033	174	8.54
Kullu	551.19	66.71	12.10	176211	0.32	2.64	661	153	23.20
Lahaul & Spiti	1402.68	216.44	15.43	19178	0.01	0.09	74	106	143.24

* Forage supply from the grasslands

The estimated forage production in Lahaul & Spiti was found surplus but much of the pasturelands were situated on very steep slopes or inaccessible high uplands. The grazing pressure was estimated as 4.98, 7.86, 2.64 and 0.10 ACU/ ha of grasslands in Bilaspur, Kangra, Kullu and Lahaul & Spiti districts, respectively.

Socio-economic characteristics of rural farm women: Age, education, occupation and participation in local bodies, self-help groups and *mahila mandals* (women groups) of rural farmwomen play an important role in performing various activities as well in decision making process. It is evident from table 2 that 57.04% of the rural farmwomen were in the age group of 25-50 years followed by <25 years (22.24%) and >50 years (20.72%).

Only 20.35 % of farmwomen were educated upto middle and above. 46.25% were illiterate in the marginal category. In case of small farm, women were better educated as 41.50% of them were educated upto middle and above. In overall farm situation 35.34, 33.74 and 30.92% of the farmwomen were illiterate, primary, middle and above, respectively. It was observed that most of the farmwomen were engaged in domestic activities (78.15%) (Household, animal husbandry and agricultural activities) followed by service (13.47%) and business (8.38%). It is evident from the table 2 that 5.29% (members) and 2.97% (office bearers) of the farmwomen were represented in the local bodies.

Table 2. Distribution of farm women according to socio-economic characteristics.

Character	Groups(Age and education)	Marginal (%)	Small (%)	All farms (%)
Age	< 25 years	25.32	19.12	22.24
	25-50 years	55.56	58.52	57.04
	>50 years	19.12	22.31	20.72
Education	Illiterate	46.25	24.42	35.34
	Primary	33.40	34.08	33.74
	Middle and above	20.35	41.50	30.92
Occupation	Service	8.21	18.74	13.47
	Business	4.59	12.16	8.38
	Domestic activities*	87.20	69.10	78.15
Women empowerment				
Local bodies	Members	4.18	6.41	5.29
	Office bearers	2.74	3.19	2.97
Self help groups	Member	7.11	12.43	9.74
	Office bearer	5.98	10.43	8.21
Mahila mandals**	Office bearer	4.59	8.64	5.88
	Member	6.85	7.16	7.75
	Others	68.55	51.74	60.15

* Domestic activities include household, animal husbandry and agricultural activities
**women groups

Table 3. Association between age and participation (average time spent /day in hrs) in different activities by the farmwomen

Farm size	Age	Animal husbandry	House hold activities	Agriculture	Total
Marginal	< 25 years	4.08	6.52	2.43	13.03
	25-50 years	5.45	6.45	3.21	15.11
	>50 years	4.53	7.31	2.19	14.03
	Overall	4.65	6.85	2.57	14.07
Small	< 25 years	4.24	6.44	2.37	13.05
	25-50 years	4.26	7.51	3.57	15.34
	>50 years	3.51	6.15	2.52	12.18
	Overall	4.02	6.65	2.84	13.51
All farm	< 25 years	4.26	6.42	2.42	13.10
	25-50 years	5.04	7.09	3.41	15.54
	>50 years	4.15	6.43	2.48	13.06
	Overall	4.46	6.67	2.77	13.90

Age and participation in different activities: Women of middle age group spent more time (15.11 hrs/day in marginal farms and 15.34 hrs/day in small farms) for different activities (Table 3). The farmwomen in the age group of <25 years spent 13.03 hrs/day (marginal) and 13.05 hrs/day (small) for different activities, while farmwomen of >50 years of age spent 14.03 hrs/day (marginal) and 12.18 hrs/day (small) for performing different activities. This indicated that higher time for different activities was spent by middle age group, because of the energy and capacity to do the work. Singh *et al.*, (2004): Chayal and Dhaka, (2010), Gupta *et.al,* (2009) also reported similar findings.

cows and 0.21 local non milking cows in marginal category, while small farms had 0.38 local milking cows and 0.23 local non milking cows. No cross bred sheep and goats were found in both categories of farms. Under overall situation 2.71 goats and 3.89 sheep/farm were found. It was observed that average number of animals increased with increase in the holding size, showing direct relationship between land holding and animal stock.

Farm women in animal husbandry activities: Rural farmwomen spend far greater time in domestic chores followed by livestock husbandry. After household chores

Table 4. Association between educational level and participation (Average time spent/ day in hrs) in different activities by farm women.

Farm size	Age	Animal husbandry	House hold activities	Agriculture	Total
Marginal	Illiterate	4.40	8.02	3.08	15.50
	Primary	5.09	6.11	2.20	13.40
	Middle and above	4.13	6.09	2.27	12.49
	Overall	4.54	6.76	2.50	13.80
Small	Illiterate	3.52	7.46	3.38	14.36
	Primary	4.18	6.27	3.06	13.51
	Middle and above	4.13	6.36	2.08	12.57
	Overall	3.92	6.71	2.82	13.45
All farm	Illiterate	4.52	6.52	3.01	14.05
	Primary	4.39	7.10	3.09	14.58
	Middle and above	4.29	6.55	2.18	13.02
	Overall	4.43	6.70	2.75	13.88

Education and participation in different activities: The farm women spent more time in households activities (48.43%) followed by animal husbandry activities (31.69%) and agriculture (19.88%). Education-wise analysis showed that total time spent for different activities by farmwomen under overall situation was found to be 14.05, 14.58 and 13.02 hours per day by illiterate, primary and middle and above level educated farmwomen, respectively (Table 4). It was observed that the educated farmwomen managed the time and work more efficiently and completed the same activity comparatively in less time as compared to other two categories.

Livestock inventory: The livestock inventory of the study area has been enlisted in Table 5. Rural farmwomen played a dominant role in rearing of these animals. Irrespective of the category of livestock, local breed was higher in number as compared to cross-breds. Small farms had 7.42 as compared to 3.82 ACU/ha in case of marginal farms. Sampled farms had 0.36 local milking

of looking after the children and cooking, women are usually away from their home during most of the day collecting grass, leaves or firewood or tending animals in the grazing lands. Collection of the dung of cattle, dumping it and later carrying it to the fields to be used as manure is the women's job. Evidently, rural women were involved in almost all livestock related activities. Time spent on all the animal husbandry activities taken together is more than 4 hours/day. Women are engaged in cleaning of animals, sheds, watering and milking of animals *etc.* Most of the time in livestock rearing activities was spent on collection and feeding of fodder as they had to travel long distance for its collection from grasslands followed by tending of the animals for grazing. On an average 2.12, 0.56, 0.35, 0.31 and 0.22 hrs/day were spent by the farmwomen on collection and feeding of fodder, animal grazing, cleaning and washing of animals shed, milking of animals and preparation of milk products, respectively. Choice of animals and Artificial Insemination of animals were the activities predominantly carried out by the men.

Table 5. Livestock inventory of farm households (Number /farm)

Livestock	Breed	Marginal	Small	All farms
Cows	Local- Milking	0.36	0.38	0.37
	Local- Non milking	0.21	0.23	0.17
	Cross bred -Milking	0.13	0.22	0.22
	Cross bred- Non milking	0.03	0.05	0.04
Buffaloes	Local- Milking	0.54	0.89	0.67
	Local- Non milking	0.31	-	0.03
	Cross bred -Milking	0.04	0.54	0.40
	Cross bred- Non milking	0.02	-	0.02
Bullocks	Local	0.82	1.14	0.94
	Cross bred	-	-	-
Young stock	Local	0.36	0.45	0.39
	Cross bred	0.16	0.20	0.18
Goats	Local	1.21	5.26	2.71
	Cross bred	-	-	-
Sheep	Local	1.17	8.53	3.89
	Cross bred	-	-	-
ACU/farm		3.82	7.42	5.18

Age wise participation in decision making: Information on women's participation in decision making in a wide array of issues (choice of animals, animal feeding, health care and utilization of milk and milk products) is presented in Table 6. Analysis revealed that most of the farmwomen of <25 years of age were either not consulted or partially consulted for decisions on various livestock rearing activities. It was observed that in all farm situation farmwomen in the age group of >50 years of age were fully consulted (46%) followed by 25-50 years (21.21%). Similar trend was observed in case of marginal and small farms in decision making. Participation in decision making process in livestock rearing activities increased with the increase in the age. Thus, the benefit of their rich experience and age was fully utilized in taking decisions. Similarly, Singh (1992) also found that women's participation in decision making was higher than that of men in case of activities like utilization of milk and milk products, selling of milk and milk products and care and management of calves.

Level of education in decision making: A perusal of the data presented in Table 7 reveals that 37.73% illiterate, 26.05% primary level and 40.90% above middle level educated farmwomen were fully consulted in decision making on the marginal farms regarding animal husbandry practices. In all the activities *viz.*, choice of the animals, animal feeding, health care and utilization of milk and milk products, the middle and above educated farmwomen had more influence in decision making followed by primary and illiterate category of farmwomen. Similar trend was observed in small farms. Therefore, the level of education influenced the decision making ability of the farmwomen in respect of livestock rearing activities. Activity–wise analysis of all farm situations showed that farmwomen were consulted fully in animal feeding followed by utilization of milk and milk products.

Production function analysis: Cobb-Douglas type of production function was used by taking income of women from time spent on different activities as dependent variable, where age (X_1) and education (X_2) were taken as independent variables. The results indicated 64 *per cent* of the variation in income of women from time spent on different activities was explained by independent variables (Table 8). The education was significant factor affecting the income of women from time spent on different activities.

Conclusion

The present study concludes that the farmwomen were over-loaded with the work. Education level played an important role in the management of work more efficiently and also in the decision making process. There was low participation of farmwomen in major decisions. The work performed by farmwomen needs to be recognized and acknowledged. The employment potential of farmwomen can be utilized in income generating activities in non-farm sectors by skill up-gradation through training and informal education. The grazing pressure was estimated as 4.98, 7.86, 2.64 and 0.10 ACU/ ha on grasslands in Bilaspur, Kangra, Kullu and Lahaul & Spiti districts, respectively.

Table 6. Age-wise participation of farm women in decision making (%) in animal husbandry practices

Activity	Age	Marginal			Small			All farms		
		FC	PC	NC	FC	PC	NC	FC	PC	NC
Choice of animals										
	<25 yrs	-	50.00	50.00	-	50.0	50.00	-	50.00	50.00
	25-50 yrs.	18.20	27.30	54.50	18.20	36.4	45.40	18.20	31.85	49.95
	>50 yrs	33.30	66.70	-	33.30	66.7	-	33.30	66.70	-
Animal feeding										
	<25 yrs	14.30	28.60	57.10	28.80	42.6	28.60	21.55	35.60	42.85
	25-50 yrs.	25.00	50.00	25.00	25.00	25.0	50.00	25.00	37.50	37.50
	>50 yrs	50.00	50.00	-	50.00	50.0	-	50.00	50.00	-
Health care										
	<25 yrs	-	33.30	66.70	-	33.3	66.70	0.00	33.30	66.7
	25-50 yrs.	11.10	22.20	66.70	22.20	33.3	44.50	16.65	27.75	55.6
	>50 yrs	50.00	25.00	25.00	50.00	25.0	25.00	50.00	25.00	25.0
Utilization of milk and milk products										
	<25 yrs	-	50.00	50.00	25.00	50.00	25.00	12.50	50.00	37.5
	25-50 yrs.	20.00	30.00	50.00	30.00	30.00	40.00	25.00	30.00	45.0
	>50 yrs	50.00	50.00	-	50.00	50.00	-	50.00	50.00	-
Overall	<25 yrs	3.58	40.48	55.95	13.45	43.98	42.58	8.51	42.23	49.26
	25-50 yrs.	18.58	32.38	49.05	23.85	31.18	44.98	21.21	31.78	47.01
	>50 yrs	45.83	47.93	6.25	45.83	47.93	6.25	45.83	47.93	6.25

FC- Fully consulted; PC – Partially consulted; NC – Not consulted

Table 7. Education-wise participation of farmwomen in decision making (%) in animal husbandry practices

Activity	Age	Marginal			Small			All farms		
		FC	PC	NC	FC	PC	NC	FC	PC	NC
Choice of animals										
	Illiterate	25.0	50.0	25.0	25.0	50.0	25.0	25.0	50.0	25.0
	Primary	12.5	37.5	50.0	12.5	37.5	50.0	12.5	37.5	50.0
	Middle and above	50.0	25.0	25.0	50.0	25.0	25.0	50.0	25.0	25.0
Animal feeding										
	Illiterate	16.7	50.0	33.3	16.7	50.0	33.3	16.7	50.0	33.3
	Primary	40.0	20.0	40.0	20.0	40.0	40.0	30.0	30.0	40.0
	Middle and above	60.0	20.0	20.0	60.0	20.0	20.0	60.0	20.0	20.0
Health care										
	Illiterate	20.0	60.0	20.0	40.0	20.0	40.0	30.0	40.0	30.00
	Primary	25.0	50.0	25.0	25.0	25.0	50.0	25.0	37.5	37.50
	Middle and above	28.6	57.1	14.3	28.6	43.8	27.6	28.6	50.5	20.95
Utilization of milk and milk products										
	Illiterate	45.60	27.20	27.20	45.40	18.20	36.40	40.90	22.70	36.40
	Primary	50.00	25.00	25.00	50.00	25.00	25.00	50.00	25.00	25.00
	Middle and above	50.00	25.00	25.00	50.00	25.00	25.00	50.00	25.00	25.00
Overall	Illiterate	38.90	33.05	28.05	38.85	25.80	35.35	37.73	29.43	32.85
	Primary	26.05	40.63	33.33	26.05	34.38	39.58	26.05	37.50	36.45
	Middle and above	40.90	38.03	21.08	40.90	34.70	24.40	40.90	36.36	22.74

FC- Fully consulted; PC – Partially consulted; NC – Not consulted

Table 8. Regression Analysis: Cobb Douglas Production Function.

Sr. No	Particulars	Coefficients	
1	Constant term	b_0	36.25
2	Age (X_1)	b_1	0.24 (0.106)
3	Education (X_2)	b_2	0.68* (0.162)
4	Coefficient of multiple determination (R^2)	R^2	0.64
5	Degree of freedom		197

Note: *Indicates significance at 5 *per cent* level of probability.

References

Anonymous, 2004. *Directorate of economic and statistics*, Ministry of Agriculture, Government of India, New Delhi.

Chayal, K. and B. L. Dhaka. 2010. Analysis of role performance of women in farm activities. *Indian J. Ext. Edu.* 10 (2): 109-112

Gupta, T., R. K. Gupta and K. K. Raina 2009. Socio-economic profile of hill woman in relation to farm activities in Himachal Pradesh-a case study. *Range Mgmt. & Agroforestry*. 30: 104-108.

Jamali, Khalida 2009. The role of rural women in agriculture and it's allied fields: A case study. *European Journal of Social Sciences*.7 (3): 71-77.

Kumbhore, S. L., K. N. S. Sharma and R. K. Patel. 1983. Standardization of bovine units. *Indian J. Anim. Sci.* 53: 547-550.

Sharma, M., A. Sood and P. S. Ahuja. 2011. Facilitating entrepreneurship amongst rural women of Himachal Pradesh through biotechnological applications. http://dbtindia.nic.in/women/paper14.htm.

Shiyani, R. L. and S. B. Vekariya. 2000. Understanding the *Femnisation* of agricultural labour. Women in agriculture and rural development. Proceedings of the workshop held on 9-10, 2000. Supplement to *Indian Journal of Agricultural Economics* 59: January – March, 2004.

Singh, C. B. 1992. Role of farmwomen in mixed farming systems: A case study of Karnal (Haryana) in India. In Peter E. Hildebrand (ed): Farming system research and extension, Deptt. of Food Resource Economics, University of Florida. http://ufdc.ufl.edu/UF00080655/00001/citation.

Singh, J. P., M. M. Roy and S. Radotra. 2009. *Grasslands of Himachal Pradesh*. Indian Grassland fodder Research Institute, Jhansi. 33-39.

Singh, P., A. Jhamtani, C. Bhadauria, R. Srivastava, R. Singh and J. Singh. 2004. Participation of women in agriculture. *Indian J. Ext. Edu.* 30: 23-27.