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Fodder Availability From Traditional Agri-silvi-horticulture Systems: Requirement and deficit w.r.t. Livestock Status in Mid Hills of Western Himalayas-A case study

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ABSTRACT

Agroforestry systems namely agri-silvi/agri-silvi-hortipasture, silvi-pasture, Horti/horti-silvipasture were dominant systems contributing to total fodder (dry and green). The overall average land holdings per family was 1.44 and 2.45 hectare in Kuthar and Arla-Kalyana, respectively. The maximum land area was recorded under agri-silvi/agri-silvi-hortipasture systems followed by silvi-pasture, Horti/ horti- silvipasture systems. The livestock population per household increased with increase in land holding. In Kuthar, the present fodder consumption deficit was observed 37.43, 37.50 and 29.95 per cent for marginal, small and medium farming families. In Arla-Kalyana maximum deficit in present consumption level over the requirement was found in large category i.e. 53.76 per cent followed by medium (48.44%), small (39.11%) and marginal (38.92%). The deficit in present production level shows the respective figures of 55.46, 56.05, 41.43 and 40.34 per cent for large medium, small and marginal categories of farmers.

Keywords:
Agroforestry, livestock, fodder availability, dry and green fodder, fodder deficit

INTRODUCTION

The agroforestry systems in the mid hill Himalayan regions exhibit great diversity with respect to woody and non-woody components (Thakur et al, 2004 and 2005) and fulfil multifarious needs like food grain, vegetable, fodder from trees, shrubs and grasses, fuelwood, timber, stacking wood from shrubs (Thakur et al, 2007). One of the most important component in the farming systems in Himalayan states in animal rearing, which plays a significant role in the economy of the Himalayan peasants. A non-competitive land use systems for forage production in the hills is to grow forage on terrace bunds and risers (Singh et al, 1993) and other traditional agroforestry systems like agri-silviculture, silvi-pasture, horti-pasture etc., are the dominant systems for fodder production (Thakur et al, 2007). Tree leaf fodder is the major feed resource during lean periods, particularly the

winters. The tree leaf fodder provides 50-90 per cent of the forage demand during lean periods (Negi 1977). Attempts have been made to asses the green and dry herbage production from sub-tropical to temperate and alpine pastures of Himalayas (Melkania and Singh 1989; Ram and Singh 1994; Singh 1995). For augmenting fodder availability, emphasis needs to be given to cultivated fodder crops on large area (Singh 1987). Forage cultivation is restricted to only about one per cent of the cultivated area in the entire Himalayan region. This is basically because of the preponderance of marginal and small land holdings in the area. Besides grazing and fodder trees, the major local forage resource is the crop residue, which again is too inadequate to sustain the livestock. There is meagre information on different land use systems (which are main source of green as well as dry forage), their annual production, number of livestock units per house hold with different categories (with respect to land holding) of farmers and their actual requirement and deficit are meagre. Therefore the present investigation was intended to find out fodder availability from different agroforestry systems being practiced by marginal, small, medium and large land holding farmers, livestock status and fodder availability (green and dry) and deficit.

MATERIAL AND METHODS

Present study was carried out in Kuthar Forest range (Kunihar Forest Division), district Solan of Himachal Pradesh which is located within longitudes 76°57' to 76°59'E and latitudes 30°57' to 30°59N' and elevation varies from 800 to 1060 m amsl [(Survey of India, Toposheet No. 53B/13 (1:50000)]. To fulfil the different objectives of study, data from farmers were collected on pre-tested schedules conducting personal interviews with each head of household. The data on land holding was collected through direct interview in two villages namely Kuthar and Arla-kalyana and on the basis of land holding size the households were categorised in to Marginal (< 1 ha), Small (1-2 ha), Medium (2-5 ha) and Large (> 5 ha). The detail of number of households under different land holding categories is given in table 1. Land use statistics information was collected for the parameters viz., land under agriculture (irrigated or un-irrigated), pasture (Ghasani), orchards etc. Similarly, information on average livestock status i.e. number of cow, buffalo, bullocks, goat etc was generated using the pre-structured proforma. The annual fodder (green and dry fodder from trees, shrubs and grasses) production per household was estimated partly through random sampling (laying quadrates of 1x1 m for grasses) and through direct interview (for fodder yielding trees and shrubs i.e. number of trees/shrubs in each land use and average fodder lopped per year). Based on the live stock status the consumption and requirement was estimated and deficit or surplus was estimated on the basis of adult cattle unit [ACU (Equivalent given by Yang, 1971)] per day requirement.

Table 1: Detail of category wise number of farmers selected for the study

Name of village	Category of farmers			
	Marginal (< 1 ha)	Small (1 -2 ha)	Medium (2 -5 ha)	Large > 5 ha)
Kuthar	13	20	7	-
Arla -Kanyana	2	15	10	3

RESULTS AND DISCUSSION

Land use statistics

The land use statistics revealed that the agriculture, pasture and horticulture were the major land use systems prevalent in Kuthar as well as in Arla-Kalyana (Table 2). In Kuthar marginal, small and medium groups possess 14.08, 53.10 and 32.82 per cent of the total land area, respectively. The average land holdings per household however were 0.62, 1.52 and 2.69 ha for marginal small and medium groups. The overall average land holdings per family was 1.44 ha. Marginal land holders had 65.84 per cent land under agriculture, 30.20 per cent under pasture and 3.96 per cent under horticulture. In small group, 62.47 per cent land was under agriculture, 32.81 per cent under pasture and 4.72 per cent under horticulture. Similarly, medium land holders had 53.08 per cent land under agriculture, 42.46 per cent was under pasture and 4.46 per cent of land under horticulture. All land uses were rainfed. In Kuthar land area has been found more fragmented compared to Arla-Kalyana, as out of 40 households 13 were found marginal land holders while only 2 (out of 30) were under same category in Arla-Kalyana (Table 1).

In Arla-kalyana medium group of families possessed highest land area followed by large, small and marginal category covering the respective land area of 38.29, 30.71, 29.03 and 1.97 per cent of the total land area. The average land holdings per household amounted to 0.76, 1.49, 2.96 and 7.92 ha for marginal, small, medium and large farming families, respectively.

Table 2: Land use statistics per household in Kuthar and Arla -kalyana (hectares)

Category	Agriculture (agri - silvi/agri -silvi - hortipasture)	Pasture (silvi - pasture)	Orchards (Horti/horti - silvipasture)	Total area	Average Land holding (ha)
			Kuthar		
Marginal	0.41 (65.84)	0.19 (30.20)	0.02 (3.96)	8.08 (14.08)*	0.62
Small	0.95 (62.47)	0.50 (32.81)	0.07 (4.72)	30.48 (53.10)	1.52
Medium	1.43 (53.08)	1.14 (42.46)	0.12 (4.46)	18.84 (32.82)	2.69
Total	**0.86 (59.86)**	**0.51 (35.61)**	**0.07 (4.53)**	**57.4**	**1.44**
			Arla -kalyana		
Marginal	0.22 (28.94)	0.52 (68.42)	0.02 (2.64)	1.52 (1.97)	0.76
Small	0.98 (66.66)	0.46 (31.37)	0.02 (1.97)	22.44 (29.03)	1.49
Medium	1.85 (62.96)	0.99 (33.52)	0.10 (3.52)	29.60 (38.29)	2.96
Large	2.56 (32.28)	4.98 (63.01)	0.37 (4.71)	23.74 (30.71)	7.92
Total	**1.8 (53.94)**	**1.09 (42.64)**	**0.08 (3.42)**	**77.30**	**2.45**

Figures in parentheses are percentages; *Percentage of the total land area in land farm

However, the average land holding was 2.45 ha/household. Marginal group had 28.94 per cent of land under agriculture, 68.42 per cent under pasture and 2.64 per cent under horticulture. In small category, 66.66 per cent of area was under agriculture, 31.37 per cent under pasture and only 1.97 per cent was put under horticulture. Likewise in large group of farmers, the area under agriculture, pasture and horticulture was 32.28, 63.01 and 4.71 per cent, respectively. The irrigated land possessed by different farming families attained the respective figures in increasing order of 9.98, 11.13, 13.16 and 16.75 per cent for small, large, marginal and medium farmers.

Land use statistics showed that small group of farmers were owner of more than 53 per cent of total land area followed by medium (32.82) and marginal (14.08). This shows the dominance of small and medium farmers having more than 85 per cent of land area. In Arla-Kalyana maximum land area was found with medium (38.29%) group of farmers whereas, it was minimum with marginal farmers (1.97%). Average land holding was found maximum in Arla-Kalyana 2.45 ha per household as compared to 1.44 ha in Kuthar, which can be attributed to large average land holding and less number of households in large group of farming community. The maximum area was recorded to be under agri-silvi/agri-silvi-hortipasture systems followed by silvi-pasture, Horti/horti-silvipasture

Livestock status

In Kuthar main livestock comprised of the cows and buffaloes irrespective of the category of farmers (Table 3). The average cows increased with increase in land holding, whereas buffalo and bullocks were higher with medium land holding farmers. Marginal land holders had higher number of buffalos and bullocks as compared to small land holders. The average livestock with marginal, small and medium land holders was 2.54, 2.60 and 3.86 animals. In Arla-Kalyana, the

Table 3: Average livestock status per household in different categories of farmers in Kuthar and Arla-Kalyana

Category	Livestock	Average no. per household	
		Kuthar	**Arla -kalyana**
Marginal	Cow	1.15	0.50
	Buffalo	1.08	1.50
	Bullock	0.31	1.00
	Goat	-	3.00
Total		**2.54**	**6.00**
Small	Cow	1.95	1.33
	Buffalo	0.45	0.80
	Bullock	0.20	0.40
	Goat	-	0.13
Total		**2.60**	**2.66**
Medium	Cow	2.43	1.40
	Buffalo	0.86	0.60
	Bullock	0.57	0.80
	Goat	-	0.50
Total		**3.86**	**3.30**
Large	Cow	-	3.67
	Buffalo	-	0.33
	Bullock	-	2.33
Total		-	**6.83**

main livestock comprised of cows, buffalows, bullocks and goats. The marginal land holders had more animals as compared to small and medium farmers. The maximum animals were recorded with large land holders.

Fodder requirement, availability and deficit

The data presented in Table 4 shows the fodder (dry + green) production, consumption and per cent deficit on consumption and production as well. Production figures in the table represents the actual production and consumption is the sum total of production from his/her own land and quantity procured from outside sources.

In Kuthar, the present fodder consumption deficit was observed 37.43, 37.50 and 29.95 per cent for marginal, small and medium farming families. The deficit over production level from all the sources has been calculated to be 46.44, 41.36 and 43.30 per cent for marginal, small and medium groups in Kuthar. In Arla-Kalyana maximum deficit in present consumption level over the requirement was found in large category i.e. 53.76 per cent followed by medium (48.44%), small (39.11%) and marginal (38.92%). The deficit in present production level shows the respective figures of 55.46, 56.05, 41.43 and 40.34 per cent for large medium, small and marginal categories of farmers (Table 4).

The figures regarding deficit on production and consumption levels of fodder over requirement indicated that there was a large gap between production and consumption levels in both the villages. Farmers were maintaining animals on outside source of fodder. Medium category of farmers in both the villages were affected more on account of fodder deficit as compared to other categories of farmers since the average number of animals were more in this category. In hilly areas production of animal fodder was less than the requirement (Toky *et al.*, 1989) and same condition was found in Kuthar and Arla-Kalyana.

Table 4: Annual fodder production, consumption and requirement (in quintals) in Kuthar and Arla-kalyana

Category	Consumption/ household	Production/ household	Requirement/ household	Percentage deficit on Consumption	Production
			Kuthar		
Marginal	175.85	150.53	281.05	37.43	46.44
Small	195.38	183.32	312.61	37.50	41.36
Medium	276.11	223.51	394.20	29.95	43.30
			Arla -kalyana		
Marginal	215.35	210.35	352.59	38.92	40.34
Small	183.34	176.34	301.08	39.11	41.43
Medium	176.01	150.01	341.32	48.44	56.05
Large	299.30	288.30	647.27	53.76	55.46

Fodder requirement is based on adult cattle unit
ACU: per day requirement = 28 kg/ACU (1/3rd dry+2/3rd green)
Adult cattle unit (ACU): Equivalent given by Yong (1971)

Cow/bullock/horse/mule	=	*1.0 ACU*
Bufallo	=	*1.3 ACU*
Young stock	=	*0.75 ACU*
Sheep and goat	=	*0.15 ACU*

CONCLUSIONS

Though livestock rearing is an important occupation of hill farming system, the forage cultivation has remained almost neglected. The production deficit in all categories of households, in both the study villages, has lead to deficit in consumption. This is basically because of the preponderance of marginal and small land

holdings in the area. Although this deficit, to some extent during lean period, may be met from forest and common lands. The study divulge that animals are underfed and hence to augment fodder availability, emphasis must be given for cultivation fodder crops on large area. Besides grazing and fodder trees, the major local forage resource is the crop residue, which again is too inadequate to sustain the livestock.

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