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LIVESTOCK INTERVENTIONS FOR IMPROVING THE LIVELIHOOD IN HILLY ECO-SYSTEM OF UTTARAKHAND

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ABSTRACT

The study was under taken to characterize the existing farming systems, analyze the constraints and option available in improved animal management practices for improving the farm household income in New Tehri district of Uttarakhand. The study was conducted in New Tehri district of Gharwal region in Uttarakhand State during 2011 to 2015. Ten villages each in Narendra Nagar Agriculture Development Block (ADB) and Thouldar, ADB were selected using stratified random sampling. In each village, ten farmers were selected. Therefore, hundred farmers in each cluster were selected and interviewed for the study. Results revealed that none of the farmers was belonging to medium and large farmers categorize in both the studied ADB. In general, household family member were more than four and their monthly income was less. Crop+dairy farming system was the most prevalent farming system in both the clusters. Non availability of quality and quantity green fodder round the year was the main constraint for low milk production. The intervention such as provision of technology for round the year fodder production, improved varieties of seeds of green fodder, feeding of mineral mixture, eradication of endoparasites and ectoparasites parasites using anthelmintics and use of heat inducing medicines improved 30-45% productive and reproductive performance in animals in Thouldar ADB and 36-53% in Narendernagar ADB. Interventions of improved animal management practices in animals resulted in the increase in total return over the existing practices in Crop + Livestock, Crop + Goatary +Livestock and Crop+ Goatry + Livestock + Horticulture was Rs.6274.2, 8780.8 and 4410 respectively in Thouldar ADB. The percentage increase in total return over existing practices was 33.0, 40.0 and 28.0 for Crop + Livestock, Crop + Goatary + Livestock and Crop + Goatry + Livestock + Horticulture respectively in Thouldar ADB. Comparatively the percentage increase in to total return over existing practices in Crop + Dairy was more in Thouldar ADB than Narendernagar ADB. Narendernagar ADB recorded higher percentage increase in to total return over existing practices in Crop + Goatary + Livestock and Crop + Goatry + Livestock + Horticulture. Change in income from goatary (%) was 69 and 71 in Crop + Goatary + Livestock and Crop + Goatary + Livestock + Horticulture respectively in Narendernagar ABD due to interventions in goat rearing.

KEYWORDS: Farming Systems, Livelihood, Livestock Interventions & Socio-Economic Characteristics

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INTRODUCTION

The majority of the population in Uttarakhand predominantly depends on mountain agriculture. The land holdings are fragmented with limited irrigation facilities (Chandola *et al.*, 2011). Soil and water erosion and several other geographical reasons are constraints in agriculture. These hilly regions are less developed in terms of infrastructure, i.e., electricity, roads and irrigation (Mittal *et al.*, 2008). Farmers holding are land locked with huge distance between market and desired resources. Majority of the population's livelihood is based on livestock rearing under subsistence cereal farming systems (Sati and Singh 2010). The rural populations in the hills either

survive on subsistence agriculture or migrate to other parts of country for employment. Due to the constriction of *Tehri* dam which resulted in displacement of farm families leading to socio-economic changes, loss of natural assets of lands, water for agriculture irrigation. There gap between demand and supply in agriculture produce in various seasons in different locations is one of the reasons leading to nutrient shortages or surpluses in Uttarakhand (Jarial *et al.*, 2013). Uttarakhand state is having huge livestock population but the productivity is low. The livestock holding per household is small which consist of different species. Livestock plays an important role in sustainable agricultural systems as the livestock produces fertilizers and can utilize agricultural waste as their fodder (Rohaeni *et al.*, 2014). Animals such as cow and buffalo in the state belong to the nondescript breed and are very small in size as compared to the cattle in plains. Productivity of these animals is low. Goat rearing is been practiced by a large section of the resource poor farmers in the hilly areas of Uttarakhand. In considering above points in the view, a study was under to characterize the existing farming situation in New Tehri district of Uttarakhand state involving constraint analysis and option available in animal management for addressing the issues for improving the farm household income.

MATERIALS AND METHODS

The Study Area

The study was conducted in New Tehri district of Gharwal region in Uttarakhand State during 2011 to 2015. Ten villages in Narendra Nagar Agriculture Development Block (ADB) and Thouldar, ADB were selected using stratified random sampling. The selected villages are located at surrounding to *Tehri* reservoir at 642 to 1313 amsl. The average annual rainfall ranges between 1102-1894 mm. The survey was conducted in 10 villages located at different altitude in each ADB. Stratified random biased sampling technique was used for the selection of villages. In each village, ten farmers having different land holding size, socio-economic condition and other available resources were selected. Therefore, hundred farmers in each cluster were selected and interviewed for the study.



Figure 1: Farmer's Participatory Bench Mark Survey

The information on prevailing cropping system/farming system, farm practices followed, irrigation water availability, farmer's socio-economic condition and other available resources were collected with the help of pre-designed questionnaires. During the study major production constraints in livestock production and management were identified

through discussion with the farmers. Based on these constraint identified, critical input interventions were made for uplifting existing farming situation at 10 house hold in each village (Total 100 household in each ADB) during 2011-12 to 2013-14. In order to assess the impact of critical input intervention at house hold level, information were recorded from individual household regarding livestock production and management.

RESULTS AND DISCUSSIONS

Socio-Personal Characteristics

The socio-personal characteristics such as land holding of farmer, age, education, occupation, household size, type of family, monthly income and participation in social activities were studied. Results revealed that majority of farmers in Thouldar and Narendra Nagar, ADB belong to marginal farmer's category. None of the farmers was belonging to medium and large farmers categorize in both the studied ADB. Most of the farmers (55% to 67%) are in the middle age group (36 to 55 year age) followed by old (>55years) and younger age group (<35 years). Small number of young farmer's population may be due to migration of youth towards urban areas in search of employment. Majority of farmers were educated upto primary level or illiterate and farming was their main occupation. In general, household family member were more than 4 and their monthly income was less than 1000 rupees/month. Whereas Kumar *et al.*, (2010) reported from Henwal water shed Tehri garhwal that, their average annual income per family per year was very low and varies from Rs 4000/- to Rs 6500/- per month. Sati, (2016) also supported our study and reported that the farmers engaged in rearing livestock are economically poor. Mane *et al.*, (2012) reported that socio-economic profile of farmer's i.e. herd size, land holding and annual income had highly significant correlation with the adoption of dairy animal management.

Table 1: Socio-Economic Characteristics of Farmers in Thouldar and Narendra Nagar ADBs

Socio-Personal Characteristics	Thouldar	Narendra Nagar
Land Holding		
Small farmer (1-2 ha)	28.8%	21.6 %
Marginal farmer (<1 ha)	71.2 %	78.4%
Age Group		
<35 year	22%	10%
36-55 years	52%	67%
>55year	26%	23%
Educational Status		
Illiterate	9%	28%
Up to primary	55%	36%
Up to Intermediate	26%	13%
Up to graduate and post graduate	10%	23%
Occupation		
Farmers	96%	95%
Agriculture labour etc.	4%	5%
Type of Family		
Nuclear	78%	47%
Joint	22%	53%
Family Composition		
Up to 3 members	10%	8%
4-5 members	38%	28%
More than 5 members	52%	64%
Social Participation		
Yes	26%	32%
No	74%	68%
Income (Rupees)		

Table 1: Contd.,		
<1000/month	46%	35%
1001-5000/month	32%	42%
>5000/month	22%	23%

Pre-dominant Farming System

The agricultural yield are low because of the small size and scattered land holdings, difficult terrain, lack of irrigation facilities and lack of or inadequate availability of improved seeds and technology. Crop+dairy farming system was the most prevalent farming system in both the ADBs. Sati, (2016) reported similar finding that the majority of farming systems in Uttarakhand are crop + livestock mixed farming under different types of agro-ecosystems. Dairy farming is an integral part of farming systems across the country (Singh *et al.*, 2012). Women have important role in farming system of hill agriculture systems. Agarwal (2008) reported that contribution of women in agricultural activities is higher than men both in terms of time spent and activities performed. Hill women rears the livestock, collect fuel and a wide range of products for consumption from forest resources (Joshi and Bhardwaj, 2015). Among the crop grown, rice, maize barnyard millet, finger millet, wheat, field pea and amaranths were pre-dominant crops whereas; potato and vegetables were grown in selected pockets where sufficient irrigation water was available. Buffalo and cow were the prominent dairy animals, whereas goat and sheep rearing was mainly in rain-fed ecosystem which, were used for meat and wool purpose. Goats play important role in the rural economy of India, because of qualities of early maturity, ability to thrive under harsh environment and low capital investment (Shankpal *et al.*, 2016). Prevalent farming system under both the ADB and the relative share of different farming system (%) is shown in figure 2 and 3. Horticultural fruit plant like mango, citrus and guava and vegetables along with dairy farming may occupy the main component of farming system in both the ADBs. It was also observed that the adoption of improved cultivars in different crops was very low and farmers mostly relying on the traditional cultivars and ultimately it results to lower crop productivity. Farmer use un-decomposed FYM which become harbour for insect and pest and ultimately lower yield. Very few farmers were using inorganic fertilizer like Urea. Due to seasonal availability of green fodder for dairy animals, the dairy enterprise was also a neglected component of existing farming system.

Constraints in Livestock Production and Management

Livestock plays an important role in the sustainable livelihood of poor people of rain-fed agro-ecosystem, because of inherent risk involved in the crop farming (Mishra 2005). Among the livestock, rearing of cow and buffalo were very common in Tehri Garhwal region for milk production. Due to seasonal availability of green fodder and poor feed management practices among the dairy animals the milk productivity was very low. Non availability of quality and quantity green fodder round the year was the main constraint for low milk production. Animals are fed with rice straw during summer season. Kumar *et al.*, (2014) reported that biofortification can enhance protein content and N, P, K, Zn and Fe concentrations of maize and wheat crop residues. Irrigation facility is not available in most of the place for green fodder production. Thomas *et al.*, (2002) also reported similar finding that the important constraint in livestock production systems of Asia is to increase the availability of feed and fodder in terms of quantity and quality. Meena *et al.*, (2011) reported that, the application of organic manures increase the yield as well as the crude protein content of fodder crops. Lack of knowledge of improved management practices, ignorance about deworming and vaccination in animals and poor animal health management practices were also constraints in livestock production. Mari, (2013) reported that the animal health is one of the most important factors that affect the productivity and profitability of raising livestock. Disease causes

heavy financial losses due to their treatment costs and animal death. Knowledge improved animal management practices can reduce diseases and increase production of dairy cattle (Lohkare *et al.*, 2015). Problem of internal and external parasites was also a major constraint in animals. Rearing farm-born calves successfully reduces herd replacement costs (Kochewad *et al.*, 2013). Reproductive health problems such as anoestrus and repeat breeding were important constraint in animal reproduction. Not getting market for milk and price for milk and milk products were the constraints reported by farmers in milk marketing.

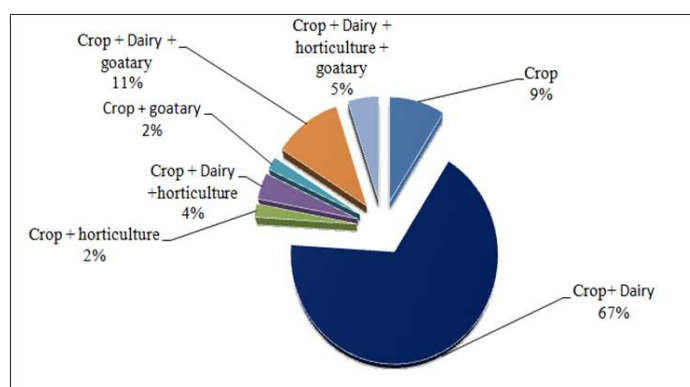


Figure 2: Prevailing Farming Systems in Thouldar, ADB

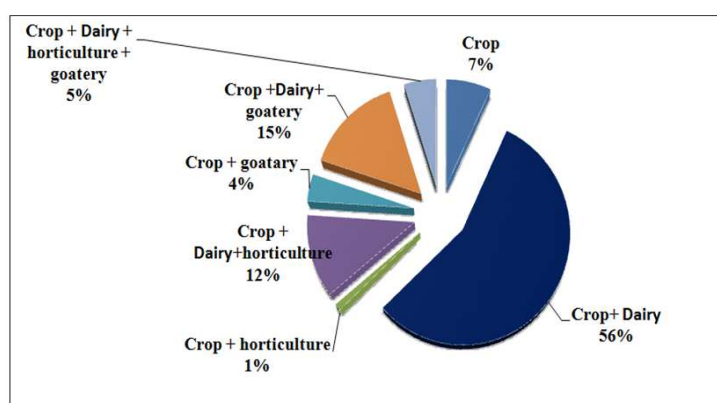


Figure 3: Prevailing Farming Systems in Narendra Nagar, ADB

Interventions in Livestock Management Practices for Improving the Productive and Reproductive Performances

Improved fodder seeds and perennial grasses were provided to the farmers to solve the problem of green fodder. The farmers fed the dairy animals with improved fodder along with their routine feed/fodder. Technology of cropping system for getting round the year green fodder was provided to the farmers. Cultivating berseem fodder variety (Cv.UPB110) during winter and growing Hybrid Napier grass on farm strip bunds provided round the year green fodder to the farmers. The problem of endo-parasite and ecto-parasites was more in this area. Broad spectrum Anthelmintics was administered to the calf as well as adult animals for eradication of ecto-parasites. Mortality in calves decreased from 15 to 7% due to administration of Anthelmintics. Ecto-parasites were controlled by using deltamethrin for external spraying and Ivermectin in injectable form. The intervention of feeding mineral mixture to dairy animals was carried out; it increased the milk production as well as the problem of anoestrus was solved. Module for addressing the problem of anoestrus in dairy animals was provided to the farmers. Deworming of animals with broad spectrum anthelmintics (Fenbendazole), feeding of mineral mixture and administration of heat inducers resulted in addressing the problem of anoestrus in animals.

The intervention such as provision of seeds of green fodder for round the year fodder production, feeding of mineral mixture, eradication of endoparasites and ectoparasites parasites using Anthelmintics and use of heat inducers medicines improved 30-45% productive and reproductive performance in animals in Thouldar ADB and 36-53% in Narendernagar ADB. The animals exhibited timely heat symptoms and improved the reproductive performance. This in turn increased the economic benefit of farmers. The change in productive performance in dairy animals due to improved management practices is shown in figure 7.

Effect on Milk Production and Related Parameters Due to Interventions

Data obtained reveals that after interventions of improved animal management practices in animals the difference in total return over the existing practices in Crop + Dairy, Crop + Goatary + Dairy and Crop+ Goatry + Dairy + Horticulture was Rs.6274.2, 8780.8 and 4410 respectively in Thouldar ADB. The percentage increase in total return over existing practices was 33.0, 40.0 and 28.0 for Crop + L Dairy, Crop + Goatary + Dairy and Crop + Goatry + Dairy + Horticulture respectively in Thouldar ADB. After interventions of improved animal management practices in animals the difference in total return over the existing practices in Crop + Dairy, Crop + Goatary + Dairy and Crop + Goatry + Dairy + Horticulture was Rs.5733, 11083.2 and 10745.7 respectively in Narendernagar ADB. The percentage increase in total return over existing practices in Crop + Dairy, Crop + Goatary + Dairy and Crop + Goatry + Dairy + Horticulture was 31.4, 50.5 and 51.7 respectively in Narendernagar ADB. Comparatively the percentage increase in to total return over existing practices in Crop + Dairy was more Thouldar ADB than Narendernagar ADB. Narendernagar ADB recorded higher percentage increase in to total return over existing practices in Crop + Goatary + Dairy and Crop + Goatry + Dairy + Horticulture. Due to the interventions of improves animal managerial practices, the milk yield per animal increased as well as the lactation length because of availability of green fodder and balanced feeding.

Effect on Goatery Enterprise

In rainfed condition goatery enterprise was the most common enterprises with marginal and landless farmer. Lack of scientific and economic approach towards goat rearing has been a major constraint in goat farming (Kochewad *et al.*, 2009). Due to seasonal availability of green grasses and poor conditions of grazing lands and improper management practices, poor housing conditions, mortality percentage of goats was high. From birth to six months of age is considered as most critical periods for the kids. High mortality in these periods is due to less resistance of young animals to various diseases, poor mothering ability of their dams due to poor feeding, poor housing management and parasitic which leads to animal weak, emaciated and death. Maximum mortality was observed in winter season followed by rainy and summer season. Interventions were made in housing management in form of providing sufficient floor space, proper drainage in the shed making the floor dry and providing enough ventilation in the animal house. In order to improve health and enhance income through goatery enterprise anthelmintics for eradication of internal and external worms were used. For control of external parasites acaricides were used. These interventions not only improved the health of these goats but also reduced the mortality percentage from 20 to 9%, which in turn increased their number significantly/house hold and ultimately annual income from these enterprises was sizeable improved. Singh *et al.*, (2009) reported that mortality can be minimized by adopting timely preventive measures, prompt treatment and necessary management intervention. Kumar Shalander (2007) reported that, the mortality rate in kids decreased due to better management, feeding and preventive healthcare. Number of goats per household increased was 4.5 in Thouldar ADB and 6.6 in Narendernagar ADB due to interventions in goatry. Change in income from goatary (%) was 91 and 93 in Crop + Goatary + Dairy and Crop + Goatary

+ Dairy + Horticulture respectively in Thouldar ABD due to interventions in goat rearing. Change in income from goatary (%) was 69 and 71 in Crop + Goatary + Dairy and Crop + Goatary + Dairy + Horticulture respectively in Narendernagar ABD due to interventions in goat rearing.

Table 2: Average Increase in Milk Productivity and Percentage Increase in Return Per Household in Thouldar ADB in Different Farming System Scenarios

Farming Systems Scenarios	Milk Production (Liter/Household/Lactation Period)			Total Return (Rs./Household/Lactation Period)			% Increase in Total Return/Household
	Before	After	Difference	Before	After	Difference	
Crop+Dairy	549.0	728.3	179.3	19216	25490	6274	33.0
Crop+Goatary + Dairy	619.5	870.4	250.9	21682	30463	8780	40.0
Crop+Goatary+ Dairy + Horticulture	451.5	577.5	126.0	15802	20212	4410	28.0

Table 3: Average Increase in Milk Productivity and Percentage Increase in Total Return Per Household in Narendra Nagar ADB in Different Farming System Scenarios

Farming Systems Scenarios	Milk Production (Liter/Household/Lactation Period)			Total Return (Rs./Household/Lactation Period)			% Increase in Total Return/Household
	Before	After	Difference	Before	After	Difference	
Crop+Dairy	521.3	685.1	163.8	18243	23976	5733	31.4
Crop+Goatary + Dairy	626.9	943.6	316.7	21942	33026	11083	50.5
Crop+Goatary+ Dairy + Horticulture	594.3	901.3	307.0	20800	31546	10745	51.7

Table 4: Total Income from Goatery in Different Farming Systems Per House Hold Before and After the Technological Interventions in Thouldar ADB in Different Farming System Scenarios

Farming Systems Scenarios	Total Goat No.		Total Meat Production (kg)		Income From Goatary Per Family (Rs.)		Change in Income From Goatary (%)
	Before	After	Before	After	Before	After	
Crop+Goatary+ Dairy	81	128	972	1856	19440	37120	91
Crop+Goatary+ Dairy +Horticulture	5	8	60	116	18000	34800	93

Table 5: Total Income from Goatery in Different Farming Systems Per Household Before and After the Technological Interventions in Narendra Nagar ADB in Different Farming System Scenarios

Farming Systems Scenarios	Total Goat No.		Total Meat Production (kg)		Income From Goatary Per Family (Rs.)		Change in Income From Goatary (%)
	Before	After	Before	After	Before	After	
Crop+Goatary+ Dairy	152	212	1824	3074	22800	38425	69
Crop+Goatary+ Dairy +Horticulture	29	41	348	594.5	20880	35670	71

CONCLUSIONS

It is concluded from the above study that the, socio-economic condition of the farmer in terms of income is low. Socio-economic, knowledge of improved livestock management and income, are assumed to be interlinked in order to improve livelihood of the farmers. Crop+ Livestock is the predominant farming system. The constraints in low productivity of crop are low land holding and lack of irrigation facilities. Livestock rearing support the income of farmers. The constraints in livestock production are non- availability of green fodder to the livestock during lean season, less animal

health facilities, lack of knowledge of improved animal management practices and non-availability of price and markets for livestock products. The interventions of improved animal management practices increased the income of the farmers in both the agriculture development blocks. Considering the above facts the policy makers should increase their participation in income generating activities through livestock interventions for improving livelihood of the farmers in the study area.

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APPENDICES

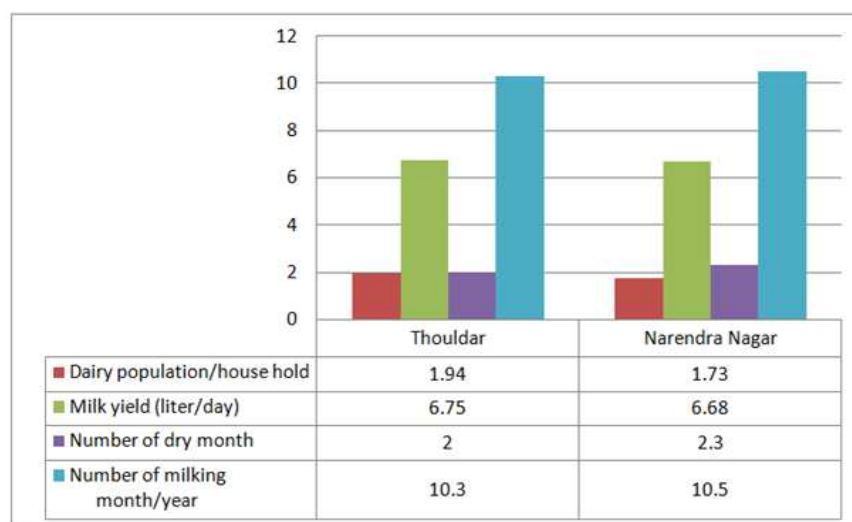


Figure 4: Effect of Different Improved Animal Management Practices on Productive Parameters in Dairy Animals

