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Assessment of Determinants for Livestock Holding Pattern in North-Eastern Dry Zone of Karnataka

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ABSTRACT: The study aimed to analyze the determinants of livestock pattern in Bellary district using multistage random sampling consisting of 120 sample size during the year 2010-11. The findings of socio-economic profile revealed that the average size of land holdings of small, medium and large farmers was 3.20, 8.00 and 22.22 acres, respectively; however the cropping intensity was 167.39% in NEK region. The findings also revealed that the total cost incurred in rearing of local cow was found to be ₹ 35.33 and a return from local cow was ₹ 40.83 per day. Rearing of buffalo incurred total cost ₹ 42.84 and total returns from buffalo was ₹ 47.54 per day. The findings revealed that the determinants of sheep and goat holding patterns of the farmer depend on decisions to hold sheep and goat are influenced by a number of factors such as Coefficient of age of the farmer was negative (-0.141) and significant at 10% level. Coefficient of total land was negative (-0.008) and significant at 5% level. Overall, the coefficient, multiple determination (R^2) revealed that the combined contribution of all the independent variables puts together explained the variation of 30.10% in the sheep and goat holding pattern. The coefficients of age of the farmer, total land were negative and having a significant relationship with sheep and goat holding implied that generally these species holder depends on common property resources for meeting their fodder and feed requirement.

Key words: Assessment, determinants, logit model, livestock and holding pattern

Introduction

In India, livestock population has increased from 485.0 million to 529.7 million during the livestock census period 2003-2007 indicating a growth rate of 9.2%. Livestock population has increased in Karnataka by 20.4% during the 2003-2007 period. The overall contribution of livestock sector accounts for 4.11% of total GDP in the country during the period of 2012-13 (19th Census, 2012). The total livestock population consisting of Cattle, Sheep, Buffalo, Pig, Goat, Mules, Horses & Ponies, Donkeys, Camels, Mithun and Yak in the country are around 512.05 million numbers in 2012. Although, the total status of livestock population has been decreased by about 3.33% over the previous census, but the number of milch animals (in-milk and dry) within cows and buffaloes has increased from 111.09 million to 118.59 million, an increase of 6.75%. During the inter-census period, the cattle population increased by 7.5%, buffalo by 7.6%, sheep by 16.4% and only 13.0% of goat. Population of exotic and cross breed cattle registered a significant increase of 34.0%, whereas the indigenous cattle increased by only 3.4% (Government of India, 2007). The gradual increase in substitution of draught animals with mechanical power and low milk yield was the main reasons of decline in indigenous cattle population (Birthal and Taneja 2006).

In mixed farming systems, livestock is kept for various reasons such as employment, manure, draught, fuel, savings, food security, income and also other socio-cultural objectives and mainly as insurance for urgent cash needs. The capital asset function of livestock is important in areas lacking formal insurance and credit mechanisms. Keeping livestock is an insurance against uncertain events which requires appreciable cash outlays, such as a wedding, funeral, hospitalization of a household member, renovation of the house, education expenses for children and other social obligations for religious functions in hospitality (Moll, 2005).

Livestock makes multi-faceted contribution to socio-economic development of rural masses. Due to the inelastic absorptive capacity for labour in other economic sectors, livestock sector has the scope for generating more employment opportunities, especially for the marginal and small farmers and landless labourers who own around 70% of the country's livestock. Livestock wealth is more equitably distributed than that of land (Anjani Kumar and Singh, 2008). The livestock is being the main source of employment and income for these dry land areas, it helps in alleviating poverty and smoothening distribution of income (Birthal *et al*., 2002).

Livestock is important both as savings and investments for the poor household and provides security or insurance through multiple ways in different production systems (Kitalyi *et al*., 2005). Livestock production is likely to undergo significant changes in terms of population adjustment, production efficiency, commercialization and intensification to respond to the increasing demand for animal based food products (Birthal and Parthasarathy, 2004). Many studies such as Saikumar (2005), Shrikant, KN. (2007). Anjani kumar, *et al.* (2008) and Chaudary, KR, *et al.* (2011) revealed the importance of livestock, especially in dry land areas which act as changing agents of rural poor in improving the standard of living by providing better employment opportunities to increase the income levels. In addition to these studies, I would like to share my research experience on how livestock holdings patterns vary

with the resources available within the farming community in North Eastern region of Karnataka.

Methodology

The present study was confined to North-Eastern Karnataka, consisting of Bidar, Bellary, Gulbarga, Koppal, Raichur and Yadgir districts. From these districts, four taluks were selected for present study. The Raichur and Kushtagi are taken as rainfed taluks, Sindhanur and Gangavati are taken as irrigated taluks. In this study, the term livestock is restricted to cattle, buffalo, sheep and goat only. The primary data was collected from 120 sample respondents by using multistage random sampling techniques in the study area during the year 2010-11. In first stage, four taluka were selected, two from rainfed area and two from irrigated area based on highest livestock population in North-Eastern Karnataka. In the second stage, three villages from each selected taluka were chosen based on the highest livestock population. In each village 10 farmers were selected randomly. In all, the total sample size constituted for the study, were 120 sample farmers. Raichur and Kustagi were taken as rainfed taluks, Sindhanur and Gangavati were taken as irrigated taluks.

Sample farmers were post-classified as small, medium and large farmers based on an area of land holding. The land holding less than 5 acres considered as a small farmer, 5-10 acres considered as medium farmer and more than 10 acres considered as large farmers for the study.

Further, logit model was estimated to identify the factors, which influence holding of particular livestock at the household level. The dependent variable is binary taking a value of 1 for particular livestock holding household, 0 otherwise.

$$P_i = E(Y=1/X_i) = 1/1+e^{-(ß_1+ß_i X_i)}$$

Where P_i= Probability that Y=1, that is, household holds particular livestock species
e = base of natural logarithm
X_i = factors that influence the household's decision to hold livestock
$ß_i$ = coefficients of the explanatory variables, X_i
In the present study the logistic regression is fitted as follows.
b_i= coefficient to be estimated

$$X_i = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} + b_{11}D_1$$

X_1= age of the farmer (year)
X_2= family size (No.)
X_3 = total land (acre)
X_4 = joint type of the family = 1, otherwise = 0
X_5 = literacy of the head of the family, literate=1, otherwise=0
X_6= no. of tractor own = 1, otherwise = 0
X_7= participation in livestock training programme = 1, otherwise = 0
X_8 = access to dairy man = 1, otherwise = 0
X_9= member of registered farmer organization = 1, otherwise = 0
X_{10} = household having a major occupation as farming = 1, otherwise = 0
D_1 = region dummy (rainfed = 1, irrigated = 0)

Cropping intensity
It is the ratio of gross cropped area of the net sown area expressed in percentage

$$\text{Cropping intensity} = \frac{\text{Gross cropped area}}{\text{Net cropped area}} \text{ X } 100$$

Variable costs

The variable costs include the cost of inputs and interest on operating capital at the rate of 8% per annum.

1) Fixed costs

These include depreciation of farm implements and machinery, interest on fixed capital and land revenue. The measurement and definitions of fixed cost components are as follows.

Depreciation charges

Depreciation on each capital equipment and machinery owned by the farmers are used for cultivation of land was calculated for an individual farmer based on the purchase value using the straight line method.

$$\text{Annual depreciation} = \frac{\text{Purchase value – Junk value}}{\text{Economic life of the asset}}$$

Interest on fixed capital
Interest on fixed capital was calculated at 11% per annum, which is the prevailing rate of investment credit. The items considered under fixed capital are implemented and machinery.

2) Returns

Gross returns

Gross returns were obtained by multiplying the total product with its unit value.

Net returns

Net returns were obtained by deducting the total costs incurred from the gross returns obtained.

Result and Discussion

The Determinants of livestock holding pattern of the farmers in the study are discussed under following sub heads, they are

1. Socio economic features

Socio economic features of the livestock holders are presented in the Table 1. The average age of the head of the family was highest in large farmers (41 years) followed by medium farmers (40 years) and small farmers (38 years). It was noticed that the literacy level of large farmers was relatively higher as compared to medium and small farmers. However, average experience in agriculture for large farmer households (18 years) was relatively higher than that of medium (17 years) and small (16 years) farmers whereas average experience in animal husbandry of medium (18 years) was relatively higher than that of small (17 years) and large (16 years) farmers.

Table 1 : Socio-economic features of sample farmers (n=120)

Characters	Unit	Small farmers (n=42)	Medium farmers (n=36)	Large farmers (n=42)
Average age of head of the family (in years)				
a. <35	Nos.	23.00	15.00	18.00
b. 36-50	Nos.	17.00	15.00	17.00
c. >50	Nos.	2.00	6.00	7 .00
d. Average age	Years	38	40	41
Education level				
Illiterates	Per cent	23.80	19.44	09.52
Primary	Per cent	40.48	25.00	21.42
High school	Per cent	28.58	25.00	28.57
College and above	Per cent	07.14	30.56	40.49
Total	Per cent	100	100	100
Experience				
Agriculture	Years	16	17	18
Animal husbandry	Years	17	18	16
Average size of family				
Male	No.	2.00	2.00	3.00
Female	No.	2.00	2.00	2.00
Children	No.	2.00	3.00	3.00
Total	No.	6.00	7.00	8.00
Type of family				
Nuclear	Per cent	42.85	72.22	59.52
Joint	Per cent	57.15	27.78	40.48
Total	Per cent	100	100	100
Size of land holding				
Irrigated	Acre	1.39	3.84	14.02
Rainfed	Acre	1.81	4.16	8.28
Total	Acre	3.20	8.00	22.22

The average family size of large farmers (8 member) was relatively higher than that of medium (7 member) and small (6 member) farmers. The types of family, number of nuclear type of family in medium farmers (72.22%) were relatively higher than that of large (59.52%) and small (42.85%) farmers and a number of joint types of family in small farmers (57.15%) were relatively higher than that of large (40.48 %) and medium (27.78%) farmers.

2. Cropping pattern

It is apparent from the results presented in the Table 2, among the different crops grown in NEK during *kharif* season, paddy occupied maximum area of 48 per cent followed by bajra (21%) while, cotton, redgram and jowar occupied 13, 13.45 and 3.19%, respectively. During *the Rabi season*, *jowar* occupied maximum area of 44%, followed by paddy (28%), Bengal gram and cotton occupied 14 and 17%, respectively. Cropping intensity in NEK region was 167%.

In rainfed taluks of NEK, among different crops grown. During *the kharif season*, Bajra occupied maximum area of 49%, and during *Rabi* season, jowar occupied maximum area of 63%. In irrigated taluks of NEK, during *kharif* season, paddy occupied maximum area of 84% and during *Rabi* season, paddy occupied maximum area of 46% to the total gross cropped area. Cropping intensity in rainfed taluk was 164 and irrigated taluk was 169%.

Cropping pattern in NEK region revealed that, in *kharif* season, paddy was the major crop contributing (48.74%) followed by bajra (21.09%), where as in *rabi* season, jowar was major contribute (44.56%) followed by paddy (28.04%). Cropping pattern in rainfed region of NEK in *kharif* were (49.60%) of bajra followed by (31.62%) of red gram, In *rabi* season, Jowar contributed (63.36%). In the irrigated region of NEK in *kharif* and *Rabi* season paddy was a major contributor of (84.80%) and (46.76%), respectively. Cropping intensity was 167.39% in the NEK region (Table 2).

Table 2 : Cropping pattern of the sample farmers owning livestock

Particulars	Rainfed taluks of NEK				Irrigated taluks of NEK				Overall			
	Kharif		*Rabi*		*Kharif*		*Rabi*		*Kharif*		*Rabi*	
	Area (acre)	%	Area (acre)	%	Area (acre)	%	Area (acre)	%	Area (acre)	%	Area (acre)	%
Paddy	-		-	-	580	84.80	304	46.76	580	48.74	304	28.04
Cotton	57	11.26	-	-	104	15.20	138	21.24	161	13.53	138	12.73
Jowar	38	07.52	275	63.36	-	-	208	32.00	38	3.19	483	44.56
Red gram	160	31.62	-	-	-	-	-	-	160	13.45	-	-
Bajra	251	49.60			-	-	-	-	251	21.09	-	-
Bengal gram	-	-	159	36.64			-	-	-		159	14.67
Total	506	100	434	100	684	100	650	100	1190	100	1084	100
Gross cropped area	940				1334				2274			
Net cropped area	573				786				1359			
Cropping intensity (%)	164.04				169.72				167.32			

3. Livestock holding pattern of the farmer

Livestock holding pattern of farmers in the study area is presented in the Table 3. Generally, in NEK region, small farmers were holding livestock followed by medium and large farmers. In all the cases, small farmers hold an average 6.54 per farm followed by medium farmers holding 5.93 and large farmers holding 4.80 per farm. In rainfed taluks of NEK, small farmers holding more livestock i.e. average 6.81 per farm followed by medium famers holds average 6.45 per farm and large farmers holds 5.09 per farms. In irrigated taluks of NEK, small farmers holding more livestock, an average small farmer holds livestock of 6.26 per farm followed by medium farmers who hold an average livestock of 5.40 per farm and large farmers hold an average livestock of 4.50 per farm.

4. Housing system of the livestock

Housing system of livestock in the study area given in Table 4. The majority of the small farmers had Katcha floor (85.71%) followed by brick and concrete floor and concrete. Roof type of housing system in small farmers was a majority in grass roof (83.33%) followed by tin sheet and asbestos sheet. Housing system in medium farmers, majority of medium farmers had Katcha floor (66%) followed by brick and concrete floor and concrete. Roof type of housing system in medium farmers were majority in grass roof (55%) followed by tin sheet and asbestos sheet. Housing system in case of large farmers, a majority of large farmers had Katcha floor (47%) followed by brick and concrete floor and concrete. Roof type of housing system in medium farmers were the majority in tin sheet (47%) followed by grass roof and asbestos sheet.

Table 3 : Livestock holding pattern of farmers in NEK region

Livestock	Rainfed taluks of NEK			Irrigated taluks of NEK			Overall (Avg. no. /farm)		
	Small farmer (n=42)	Medium farmer (n=36)	Large farmer (n=42)	Small farmer (n=42)	Medium farmer (n=36)	Large farmer (n=42)	Small farmer (n=42)	Medium farmer (n=36)	Large farmer (n=42)
Cattle	2.30	2.85	2.40	1.30	1.52	1.42	1.80	2.19	1.91
Buffalo	1.04	0.90	0.88	2.61	2.60	2.40	1.83	1.75	1.64
Bullock	1.15	1.62	1.31	0.24	1.18	0.56	0.70	1.40	0.94
Sheep	1.30	0.58	0.30	1.11	0.00	0.00	1.21	0.29	0.15
Goat	1.02	0.50	0.20	1.00	0.10	0.12	1.01	0.30	0.16
Total	6.81	6.45	5.09	6.26	5.40	4.50	6.54	5.93	4.80

Table 4 : Housing system of the livestock

Particular	Small farmer (n=42)		Medium farmer (n=36)		Large farmer (n=42)	
	No.	%	No.	%	No.	%
Type of floor						
katcha	36	85.71	24	66.66	20	47.61
Concrete	2	04.76	4	11.11	10	23.82
Brick and concrete	4	09.53	8	22.23	12	28.57
Total	42	100	36	100	42	100
Type of roof						
Grass	35	83.33	20	55.55	15	35.71
Tin sheet	6	14.28	12	33.33	20	47.62
Asbestos sheet	1	02.39	4	11.12	7	16.67
Total	42	100	36	100	42	100

5. Production pattern of milch animal

Production pattern of milch animals in NEK region is given in Table 5. The study region, recorded 197 local cows and 202 buffaloes. During lactation period, the local cow gave highest milk yield of 4.51 lit/day and low of 2.43 lit/day with an average milk yield of 3.47 lit/day. Whereas during lactation period, buffalo gave highest milk yield of 4.67 lit/day and lowest of 2.49 lit/day with average milk yield of 3.58 lit/day. On an average, a local cow remained in milk for 205 days and buffalo remained in milk for 220 days. The average selling price of milk per litre recorded was ₹ 18.5 for cow milk and ₹ 23.75 for buffalo milk.

6. Cost and return structure of milk production in different types of milch animal

Details on cost and returns of milk production in different types of milch animal in NEK region is presented in the Table 6. It is apparent from the table that the total cost incurred in rearing of local cow was ₹ 36 per day. Among the major different items of components of costs, fixed cost and Variable cost. Fixed cost includes depreciation and interest on milch animal sheds and store, dairy equipments and milch animals. Fixed cost was ₹ 7.34, fodder cost was ₹ 13.75 (47.41 %), cost of concentrates was ₹ 5.00 (17.24 %) and labour cost ₹ 8.25 (28.45) per day. For the total returns from local cow was ₹ 43.51 per day. Among the returns, sale of milk ₹ 36.11 (82.99 %), sale of calf ₹ 5.75 (13.22 %) and sale of dung ₹ 1.65 (3.79 %) per day. As same case in buffalo rearing in NEK region was total cost ₹ 45.35 per day. Among the different cost, fixed cost was ₹ 8.85, fodder cost was ₹ 16.5 (45.21 %), cost of concentrates was ₹ 7.00 (19.18 %) and labour cost ₹ 10.00 (27.40 %) per day. For the total returns from buffalo was ₹ 59.74 per day. Among the returns, sale of milk ₹ 51.32 (85.91 %), sale of calf ₹ 6.12 (10.24 %) and sale of dung ₹ 2.30 (3.85 %) per day.

In rainfed taluks of NEK region, total cost incurred in rearing of local cow was Rs. 35 and a return from local cow was ₹ 40.83 per day. Rearing of buffalo incurred total cost ₹ 42.84 and total returns from buffalo was ₹ 47.54 per day. In irrigated taluks of NEK region, total cost incurred in rearing of local cow was ₹ 37.34 and total returns from local cow was ₹ 46.39 per day. As same case in buffalo rearing, total cost was ₹ 47.85 and a total return from buffalo was ₹ 73.90 per day.

In NEK region total cost incurred in rearing of local cow and buffalo was ₹ 36.33 and ₹ 45.34 per day, respectively. For the total returns from local cow was ₹ 43.51 per day and total returns from buffalo was ₹ 59.74 per day (Table 6).

Table 5 : Production pattern of milch animals in the NEK region

Particulars	Rainfed taluks of NEK		Irrigated taluks of NEK		Overall	
	Local cow	Buffalo	Local cow	Buffalo	Local cow	Buffalo
Total record of milch animal	128	52	69	150	197	202
Highest milk yield in a lactation (lit/day/animal)	4.43	4.14	4.10	5.20	4.27	4.67
Lowest milk yield in a lactation (lit/day/animal)	2.36	2.07	2.03	2.91	2.20	2.49
Milk yield (lit/day/animal)	3.40	3.11	3.07	4.06	3.23	3.58
Lactation period (days)	197	200	213	240	205	220
Selling price of milk (Rs./lit)	16.00	22.80	15.80	23.03	15.90	22.91

Table 6 : Cost and return of milk production in different types of milch animals NEK region (₹/animal/day)

Sl. No.	Components of cost and return	Rainfed taluks of NEK				Irrigated taluks of NEK				Overall			
		Local cow		Buffalo		Local cow		Buffalo		Local cow		Buffalo	
		₹	%	₹	%	₹	%	₹	%	₹	%	₹	%
A	Fixed cost												
I	Interest on fixed capital	4.41	64.57	5.23	62.71	4.96	63.27	5.78	61.82	4.69	64	5.51	63
Ii	Depreciation on fixed assets	2.42	35.43	3.11	37.29	2.88	36.73	3.57	38.18	2.65	36	3.34	37
	Total fixed cost	6.83	100.00	8.34	100.00	7.84	100.00	9.35	100.00	7.34	100.00	8.85	100.00
B	Variable cost												
I	Fodder cost	15	52.63	18.00	52.17	12.50	42.37	15.00	38.96	13.75	48	16.50	46
ii	Cost of concentrates	4	14.04	6.00	17.39	6.00	20.34	8.00	20.78	5.00	17	7.00	19
iii	Labour cost	7.5	26.32	8.00	23.19	9.00	30.51	12.00	31.17	8.25	28	10.00	27
iv	Cost of medicine and veterinary services	2	7.02	2.50	7.25	2.00	6.78	3.50	9.09	2.00	7	3.00	8
	Total variable cost	28.5	100.00	34.50	100.00	29.50	100.00	38.50	100.00	29.00	100.00	36.50	100.00
	Total cost (A + B)	35.33		42.84		37.34		47.85		36.33		45.34	
C	Sale of milk	33.03	80.90	39.19	82.44	39.39	84.91	65.40	88.50	36.11	83	51.32	86
D	Sale of calf	6	14.70	6.25	13.15	5.50	11.86	6.00	8.12	5.75	13	6.12	10
E	Sale of dung	1.8	4.41	2.10	4.42	1.50	3.23	2.50	3.38	1.65	4	2.30	4
	Total return (C + D + E)	40.83	100.00	47.54	100.00	46.39	100.00	73.90	100.00	43.51	100.00	59.74	100.00

7. Yield and returns of milk production in different types of milch animal

Yield and returns of milk production in different types of milch animal in NEK region is given in Table 7. In NEK region, local cow milk yield was 712 lit/annum/animal and buffalo milk yield was 789 lit/annum/animal. Total cost per local cow was ₹ 13264 and buffalo was ₹ 16550 per year. Total gross return from local cow was ₹ 15881 and buffalo was ₹ 21805 per year. Net return from local cow was ₹ 2617 and buffalo was ₹ 5255 per year. Returns per rupee of expenditure in cattle were, 1:1.20 and buffalo was 1:1.32. The average cost of production per liter of milk in local cow was ₹ 10.46 and buffalo was ₹ 12.78.

8. Determinants of cattle holding pattern of the farmers

The farmer's decisions to hold cattle are influenced by a number of household factors estimated by using binary logistic model are presented in Table 8. As indicated in the table, the coefficient of determination (R^2) was 0.268, indicated that the variables included in the function is explained by 26.80%. The dependent variable is binary taking a value of 1 if a farmer holding cattle, zero otherwise. Thus the number of cattle holder 95 and non cattle holder is 25 accounting 120 observations. The relationship between farm size and cattle holding was found positive and significant at 10% level. The coefficient of joint type of family was negative and significant at 5% level. Coefficient of literate of the head was negative and significant, number of own tractors

Table 7 : Yield and returns of milk production in different types of milch animal in NEK region

Categories	Rainfed taluks of NEK		Irrigated taluks of NEK		Overall	
	Local cow n=128	Buffalo n=52	Local cow n=69	Buffalo n=150	Local cow n=197	Buffalo n=202
Milk yield (lit/ animal/ annum)	670	622	756	974	712	789
Total cost (₹/annum/animal)	12896	15637	13505	17465	13264	16550
Gross return (₹/annum/animal)	14903	17352	16932	26973	15881	21805
Net return (₹/annum.)	2007	1715	3427	9508	2617	5255
Returns per rupee of expenditure (₹)	1.16	1.11	1.25	1.54	1.20	1.32
Average cost of production per lit of milk (₹/day)	10.4	13.77	10.51	11.78	10.46	12.78

Table 8 : Determinants of cattle holding pattern of the farmers

Variable	Coefficient	Standard error
Age of the farmer (years)	-0.015	0.031
Family size (No.)	0.228*	0.139
Total land (acre)	0.115**	0.058
Type of the family	-1.523**	0.647
Literacy of the head of the family	-1.541*	0.843
No. of tractor owned	1.894*	1.023
Participation in training programme	-0.418	0.698
Access to dairy man	-0.504	0.595
Member of registered farmer organization	0.460	0.630
Household like farming	2.227***	0.834
Region	2.386***	0.746
Constant	0.427	1.620
Chi-squared	5.428	
Log-likelihood	85.367	
Number of observation	120	
R^2	0.268	

*, **, *** Significance at 10, 5 & 1% level, respectively.

were positive and significant relationship with cattle holding. Coefficient of household like family size was positive (0.228) and significant(09).

Determinants of buffalo holding pattern of the farmers

The farmer's decisions to hold buffalo are influenced by a number of household factors estimated by using binary logistic model are presented in table 9. As indicated in the table, the coefficient of determination (R^2) indicated that the variables included in the function had is explained by 26.80%. The dependent variable is binary taking a value of 1 if a farmer holding buffalo, zero otherwise. Thus the number of buffalo holder 88 and non buffalo holder 32 accounting 120 observations. The coefficient of family size and joint type of family, both are positive and significant at 5% level relationship with buffalo holding. Coefficient of rainfed region was negative and significant at 1% level (10).

Determinants of bullock holding pattern of the farmers

The farmer's decisions to hold bullock are influenced by a number of household factors estimated using binary logistic model the results are presented in Table 10. As indicated in the table, the coefficient of determination (R^2) was 0.356, indicated

Table 9 : Determinants of buffalo holding pattern of the farmers

Variable	Coefficient	Standard error
Age of the farmer (years)	-0.003	0.030
Family size (No.)	0.342**	0.149
Total land (acre)	-0.055	0.053
Type of the family	1.579**	0.683
Literacy of the head of the family	0.069	0.758
No. of tractor owned	-0.613	0.994
Participation in training programme	0.313	0.600
Access to dairy man	0.204	0.550
Member of registered farmer organization	0.001	0.569
Household like farming	-0.261	0.582
Region	-2.110***	0.587
Constant	-1.446	1.598
Chi-squared	5.925	
Log-likelihood	101.76	
Number of observation	120	
R^2	0.268	

*, **, *** Significance at 10, 5 and 1% level, respectively.

Table 10 : Determinants of bullock holding pattern of the farmers

Variable	Coefficient	Standard error
Age of the farmer (years)	0.028	0.028
Family size (No.)	0.215*	0.117
Total land (acre)	0.031	0.043
Type of the family	-0.704	0.537
Literacy of the head of the family	1.515**	0.764
No. of tractor owned	-1.178*	0.852
Participation in training programme	-0.636	0.541
Access to dairy man	0.097	0.512
Member of registered farmer organization	-0.261	0.523
Household like farming	-0.564	0.554
Region	1.749***	0.491
Constant	-2.307	1.481
Chi-squared	5.490	
Log-likelihood	113.460	
Number of observation	120	
R^2	0.356	

*, **, *** Significance at 10, 5 and 1% level, respectively.

Table 11 : Determinants of sheep and goat holding pattern of the farmers

Variable	Coefficient	Standard error
Age of the farmer (years)	-0.008*	0.029
Family size (No.)	-0.099	0.127
Total land (acre)	-0.141**	0.071
Type of the family	-0.578	0.574
Literacy of the head of the family	-0.430	0.663
No. of tractor owned	0.284*	0.981
Participation in training programme	1.078	0.625
Access to dairy man	-0.639	0.522
Member of registered farmer organization	0.828	0.529
Household like farming	0.562*	0.520
Region	0.941*	0.051
Constant	1.118	1.765
Chi-squared	15.738	
Log-likelihood	109.780	
Number of observation	120	
R^2	0.301	

*, **, *** Significance at 10, 5 and 1% level, respectively.

that the variables included in the function is explained by 35.60%. The dependent variable is binary taking a value of 1 if a farmer holding bullock, zero otherwise. Thus the number of bullock holder is 61 and non bullock holder is 59 accounting to 120 observations. The coefficient of family size was positive and significant at 10% level. Coefficient of literacy of the farmers was positive and significant at 5% level. Coefficient of number of tractor own was negative and significant at 10% level. The coefficient of rainfed region was positive and significant at 1% level.

Pattern of the farmers

The farmer's decisions to hold sheep and goat are influenced by a number of household factors estimated by using binary logistic model are presented in Table 11. As indicated in the table, the coefficient of determination (R^2) was 0.301, indicated that the variables included in the function had explained by 30.10%. The dependent variable is binary, taking a value of 1 if a farmer holding sheep and goat, zero otherwise. Thus the number of sheep and goat holder is 40, non sheep and goat holder is 80 accounting upto 120 observations. Coefficient of age of the farmer was negative and significant at 10% level. Coefficient of total land was negative and significant at 5% level and coefficient of tractor owned was positive and significant at 10% level. Coefficient of household like farming and rainfed region were positive and significant at 10% level.

Conclusion

The study concludes that the cropping intensity in rainfed and irrigated taluks of NEK region was 164.04 and 169.72%, respectively compared to overall cropping intensity in NEK region of 167.32%. Further, in study region, small farmers were holding more livestock (average 7.60 per farm) followed by medium farmers (7.13 per farm) and large farmers (6.37 per farm). In rainfed and Irrigated taluks of NEK small farmers hold more livestock followed by medium and large farmers. The study also revealed that the returns per rupee of expenditure in cattle were ₹ 1.20 and buffalo was ₹ 1.32. The average cost of production per liter of milk in local cow was ₹ 10.46 and buffalo was ₹ 12.78. Further, the determinants of cattle holding indicated as family size, total land, the number of tractor own, household like farming and rain-fed region were positive and significant. Whereas type of the family, literacy of the head were negative and has a significant relationship with cattle holding. However, the Determinants of buffalo holding indicated as family size and type of family were positive and significant. Whereas access to progressive farmer and rain-fed region were negative and has a significant relationship with buffalo holding. The findings also showed that, the determinants of sheep and goat holding indicated as household like farming. Number of tractor own and rainfed region were positive and significant. Whereas age of the farmer and total land were negative and significant relationship with sheep and goat holding.

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