

Profile of Livestock Production in Thal Desert of Pakistan

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Abstract

In Pakistan, since the introduction of Green Revolution technologies, the crop sector has earned relatively more attention of the policy makers and agricultural development practitioners than the livestock sector. Despite that the relative share of livestock sector in total agricultural GDP kept on silently increasing almost regularly. In the rural areas, livestock is considered as a more secure source of income for the small farmers and landless poor. Similarly, a consideration proportion of rural households in desert ecologies especially Thal desert at drawing their livelihood from livestock farming. Therefore the present study is intended to examine the livestock profile of the area with regards to the herd size.

The results of the study reveal that the normal herd size was almost 17 standard animal units. The important objectives of livestock farming were to meet with the milk consumption, and sale of animals. Natural breeding was more common than artificial breeding method. In general the large group of livestock holders was rich as compared to the other groups in producing and sale of milk and livestock related products whereas small group of herders were observed poorest than middle and large livestock holders. The lack of credit facilities to livestock holders and their involvement in the commercialization of livestock production were limited. Disease diagnosis and first aid, improving crops and fodder production were the large areas regarding training requirement while provision of electricity and schools were primary necessities of livestock holders of the people.

The development of infrastructure and institutional credit facilities and trainings should be provided to the farmers. It is also suggested that the genetic potential of livestock breeds, artificial insemination and services of good breed of sires should be popularized. The development planers and practitioners of the area should award due consideration to the problems of small sized farmers and herders and need to design regulatory framework for milk and livestock marketing systems.

Keywords

Livestock Production, Herd Size Group, Livestock holders, Thal Desert Pakistan, Significance Level

1. Background of the Study

Livestock has been subsistence sector dominated by small holders to meet their needs of milk, food and cash incomes on daily basis. In the rural areas, livestock is considered as a more secure source of income for the small farmers and landless poor. It has become important source of employment generation in rural areas. The sector is mitigating income variability in the rural areas as crop sector is more dependent on uncertain vagaries of nature and climate/weather changes. The poverty incidence in Pakistan is determined by income variability and thus livestock is the best hope for poverty alleviation as it can uplift the socioeconomic conditions of our rural masses (Farooq et al. 2010). In Pakistan livestock has major part in agriculture sector. Livestock contributes for 55.4% of agricultural value added. Livestock contribution was 11.9% in national gross domestic products during 2012-2013. Around 30-35 million pastoral communities are dependent on livestock sector for their wellbeing (Government of Pakistan 2013).

For the development of livestock sector, though the government is spending good amounts of money, however, the desert areas of Pakistan where livestock is the only major source of rural households' income is still ignored. For instance, in 2010-11, Government has spent Rs.8.8 billion on seven mega projects. These projects have focused on promoting milk and meat production/marketing, strengthening of extension services, delivery mechanism system to livestock farmers and control of livestock and poultry diseases, up-gradation of animal quarantine services, provision of veterinary services at farmers' door step (Government of Pakistan, 2011). What proportion of this allocation has been spent in desert areas could be easily seen at these places where the problems of the individual livestock herders are almost same as they were 2 to 3 decades ago.

In other words the livestock farming in the desert economies deserve special attention of the researchers and policy makers on all types of poverty indicators and much lagging behind in the infrastructure development. A considerable proportion of rural households in Thal desert at drawing their livelihood from livestock farming particularly when the prospects of income from crop sector are meager compared to the livestock sector. Generating information on herd size basis shall also be helpful to different stakeholders in the next livestock census.

2. Aim of the Study

Pakistan Agricultural Research Council (PARC) is the apex institution in the agricultural research in Pakistan. In mid-2000s, the social scientist of PARC has taken an important initiative to update the livestock farming related information in the desert ecologies of Pakistan, as such information was not available --- and it is still scanty also --- under the Agricultural Linkages Program of PARC. This data set was consisted of detailed information on livestock farming in Desert ecologies including Thal Desert. The Thal Desert report of ALP project presents a detailed analysis of livestock farming in the desert, but from the regional perspectives. That is, all the analysis has been carried out on tehsils basis rather than herd size basis. The primary consideration was to document the regional differences in the livestock farming in Thal desert so that if such disparities are found, how it could be addressed through policy, research and development interventions. In this report the livestock farming differences based on herd sizes

were not touched at all. It has, therefore, been realized to generate information on herd basis also, by analyzing the same data set, in order to provide further enrich our researchers, policy makers and development practitioners in terms of livestock farming in desert ecologies of Pakistan taking Thal desert as one of them.

3. Objectives of the Study

The objectives of the study in hand are:

- To study the livestock composition, production systems, marketing patterns of live animals and milk by herd size groups in the study area;
- To study the production and marketing related constraints faced by the livestock herders in the area; and,
- To suggest various guidelines in a prioritized fashion for the development of livestock economy of Thal Desert of Pakistan.

4. Methodology

The data for this research work is obtained from Pakistan Agriculture Research Council (PARC). The study area is comprised of six districts Jhang, Mianwali, Khushab, Layyah, Muzaffar Garh, and Bhakkar. However PARC has selected three largest tehsils of the region Noorpur, Chaubara and Mankera falling in Khushab, Layyah and Bhakkar districts respectively for the collection of data by using the stratified random sampling method. The data used in this research paper is related to the period of 2005-2006. According to the PARC 40 livestock holders were interviewed from each tehsil, so that the data gathered from total of 120 sample size will be used in this study.

The data in the research paper is examined by herd size groups. The herd size is categorized in to three groups i.e. small herd size group, medium herd size group, and large herd size group. Herd size less than 10 standard animal units are considered as small herd size, 10 to 20 animal units are taken as medium herd size and greater than 20 standard animal units are measured in the category of large herd size group.

Priority Analysis of Objectives and Development Needs

In the available data, the respondents prioritized and classified some important causes of livestock sale. The priority and classification about the livestock sale factors was monitored as 0 for least important, 3 for important, and 5 for most important. The obtained data for development need, objectives of keeping animals, livestock sale purpose, need of livestock related training were converted to the percentage using the following equations. For example, for the factors determining the livestock sale is measured as:

$$W_i = \frac{X_i}{\sum_{i=1}^n X_i} \times 100 \dots \dots \dots (1)$$

Where

W_i = Percent weight of the *ith* factor of livestock sale

X_i = Score of the *ith* factor of livestock sale

$\sum X_i$ = Total sum of all scores of included factors of livestock sale

- $i = 1$, danger of disease incidence,
- = 2, Qurbani months arrived close,
- = 3, falling animals health status,
- = 4, urgent monetary needs,
- = 5... So on

5. Statistical Analysis

For descriptive analysis purpose the data is presented in the form of simple-tables, consist of mean values, frequency and percentage for comparison across the groups by using SPSS. Frequencies across groups are computed using the χ^2 (chi-square) tests while the mean values across groups are tested by using F-test.

5. Results and Interpretation

5.1. Livestock Population, Composition and Production Patterns

5.1.1 Livestock Species and Age Composition

According to the age composition the overall average farm of buffalo was consist of 1.54 adult buffaloes 0.34 heifers 0.63 young stock. The average farm of 7 cattle was comprised of 4.42 adult cows, heifers 0.86, and 1.72 young stocks. An average farm having 16.7 sheep was consisting of 12.4 adult sheep and 4.25 young stocks. On average, population of camel per farm was 0.88. While average farm size of 22.8 goats was comprise of 16.3 adult goats and 6.45 young stocks. On average a single farm of livestock was consisting of 16.7 animal units as depicted in Table 1.

Table 1: Animal types and livestock composition of owned animals in Thal Desert of Pakistan

Animal Species/Types	Herd Size Groups			Overall	Sig. level
	Small	Medium	Large		
Buffaloes (#):					
Adult Buffaloes	0.34	1.44	3.41	1.54	0.000
Heifers	0.19	0.18	0.83	0.34	0.037
Young Stock	0.12	0.64	0.13	0.63	0.000
Total	1.3	2.26	4.37	2.51	-
Cattle (#):					
Adult Cows	2.09	4.67	7.41	4.42	0.000
Heifers	0.41	1.14	1.03	0.86	0.035
Young Stock	1.00	1.84	2.52	1.72	0.000
Total	3.51	7.56	10.9	7.00	-
Camels (#):					
Adult camels	0.29	0.58	1.48	0.70	0.000
Heifer Camels	0.02	0.02	0.06	0.03	0.476
Young Stock	0.07	0.16	0.27	0.15	0.152
Total	0.38	0.76	1.82	0.88	-
Sheep (#):					

Adult Sheep	3.80	8.76	30.7	12.4	0.000
Young Stock	1.55	2.90	10.3	4.25	0.000
Total	5.35	11.6	40.9	16.7	-
Goats (#):					
Adult Goats	7.12	10.9	38.7	16.3	0.000
Young Stock	3.28	4.66	14.1	6.45	0.000
Total	10.4	15.5	52.8	22.8	-
Donkeys (#)	0.24	0.18	0.21	0.21	0.797
Mules (#)	0.00	0.02	0.20	0.05	0.064
Other animals (#)	0.09	0.12	0.00	0.08	0.386
Animal units (#)	6.64	14.2	35.5	16.7	0.000

5.1.2. Livestock Grazing and Stall Feeding Practices

According to the results the percentage of separate grazing was highest, 65.8 percent herders were engaged in separate grazing for small and large ruminants, and this percentage was higher for large size group and lowest for small size of livestock farming households. Total percentage of mixed grazing was 26.6 percent. Purely stall feeding was practice by 4.26 percent herders (Table 2).

Table 2: Livestock grazing method (% farmers) on sample farms in Thal Desert of Pakistan

Grazing Method	Herd Size Group			Overall	Sign. Level
	Small	Medium	Large		
No grazing/stall feeding	7.32	2.00	3.45	4.26	0.127
Separate grazing	56.1	66.0	79.3	65.8	
Mixed grazing	36.5	28.0	10.3	26.6	
Both	0.00	4.00	6.90	3.33	

5.1.3. Livestock Reproduction

The major breeding method used in the study area was natural breeding the overall percentage for this method was 67.5. The artificial insemination method used in Thal desert was 10 percent while 22.5 percent people used both natural and artificial methods. The inter group difference for the breeding methods was statistically significant (Table 3).

Table 3: Breeding methods (% farmers) on sample farms by Herd Size Groups in Thal Desert of Pakistan

Breeding Methods	Herd Size Group			Overall	Sign. Level
	Small	Medium	Large		
Natural	78.0	54.0	75.6	67.5	0.036
Artificial	9.76	16.0	0.00	10.0	
Both	12.2	30.0	24.1	22.5	

For breed controlling and management the overall percentage of selected bull was 60.8 this signifies that the livestock herders of the Thal desert were sensitive to get high level of production of meat and milk by using well reputed bull for breeding. This percentage was 13.3 for uncontrolled breeding. Only 3.44 percent people of large group tend to use uncontrolled and non-selected bull for breeding. Overall 25.8 percent people managed both selected and non-selected bull for breeding purpose. The inter group disparity for breed controlling and management was statistically insignificant (Table 4).

Table 4: Large Ruminants’ breeding management (% farmers) on samples by herd size groups in Thal

Breed Controlling	Herd Size Group			Overall	Sign. Level
	Small	Medium	Large		
Selected Bull	60.9	62.0	58.6	60.8	0.117
Non Selected/Any Bull	21.9	12.0	3.44	13.3	
Both	17.0	26.0	37.9	25.8	

5.2. Objectives of Livestock Farming

The main objective of keeping buffalo was home consumption of milk with overall 44.8%, sale of young stock 14.9%, sales as breeding animals 11.8%, sale of adult animals 10.9%, sale of dairy products 7.85%, status symbol 6.8%, and sale as sacrificial animals 2.71%. Small size of farmers was not keeping buffaloes for sale as sacrificial animals. Inter group difference for the mostly objectives listed were statistically significant except for the sale of young stock, dairy products and sacrificial animals.

Home consumption of milk was also the main objective of keeping cattle for the all groups with 44.5 percent. The other purposes of keeping cattle were sale of young stock, sale as sacrificial animals, sale of adult animals, sale as breeding animals, status symbol, and sale of dairy products in a decreasing order. The ranking of objectives about keeping camels is different from that of cattle and buffaloes and same with the studies of Ali et al. (2009) about camel farming objectives in Cholistan Desert as a so source of transportation and loading animals.

Farmers have different ranking of objectives regarding the small ruminant’s sale. The main objectives of keeping goats and sheep were sale of young stock, sale of adult animals, sale of sacrificial animals, home consumption, sale of wool, sale as breeding animals, status symbol, sale of dairy products and rising for export purpose were the main objectives in a descending style. The results of the study is same to that of Gobind *et al.* (2009) about Thar desert and Guy (2014) about Gobi desert where people are also engaged in farming livestock for nutritional needs of household, commercial purposes and status symbol.

Table 5: Objectives (% score) of keeping various livestock species in Thal Desert of Pakistan

Animals / Objectives	Herd Size Groups			Overall	Sign. Level
	Small	Medium	Large		
Buffaloes:					
Home consumption of milk	50.4	44.2	42.2	44.8	0.000
Sale of young stock	21.0	13.7	13.5	14.9	0.237
Sale as breeding animals	5.89	13.1	12.7	11.8	0.010
Sale of adult animals	9.25	10.9	11.6	10.9	0.045
Status symbol	5.04	6.10	8.52	6.85	0.044
Sale of dairy products	5.04	8.84	7.75	7.85	0.084
Sale as sacrificial animals	0.00	3.05	3.49	2.71	0.079
Other	3.37	0.00	0.00	0.60	0.385
Cattle:					
Home consumption of milk	53.3	43.42	37.42	44.5	0.090
Sale of young stock	17.5	18.0	20.9	18.6	0.042
Sale as sacrificial animals	8.82	12.97	15.5	12.5	0.040
Sale of adult animals	11.8	12.97	11.67	12.4	0.351
Sale as breeding animals	2.73	4.14	7.18	4.6	0.038
Status symbol	3.94	4.14	2.99	3.7	0.767
Sale of dairy products	1.52	2.70	2.99	2.5	0.470
Other	0.61	1.62	1.20	1.23	0.676
Camels:					
Sale of	49.4	24.8	32.4	32.5	0.007

load/pack animals					
Sale of ride animals	13.9	16.9	18.5	17.1	0.030
Sale of adult animals	11.8	12.4	14.3	13.1	0.050
Sale of young stock	6.44	12.4	12.96	11.6	0.019
Sale as breeding animals	2.15	7.55	6.02	5.9	0.066
Home consumption	0.00	0.00	5.18	2.2	0.022
Status symbol	1.07	2.58	2.31	2.2	0.557
Sale as sacrificial animals	0.00	3.57	0.93	1.8	0.341
Raising for export purpose	0.00	0.00	0.46	0.2	0.209
Other	15.04	19.9	6.94	13.5	0.386
Sheep/Goats:					
Sale of young stock	29.6	29.5	24.9	29.1	0.702
Sale of adult animals	21.2	25.3	17.9	20.4	0.916
Sale as sacrificial animals	13.7	19.5	20.7	18.2	0.048
Home consumption	22.3	13.14	13.25	16.4	0.047
Sale of wool	6.18	4.76	10.9	6.9	0.016
Sale as breeding animals	3.54	2.46	7.28	4.4	0.059
Status symbol	2.18	1.31	0.26	2.1	0.444
Sale of dairy products	0.17	0.82	0.26	0.5	0.622
Raising for export purpose	0.00	0.66	0.00	0.3	0.500
Sale of ride animals	-	-	-	-	-
Sale of	0.00	0.00	-	-	-

load/pack animals					
Other	0.90	1.97	2.08	1.7	0.659

5.3. Marketing of Livestock and Livestock Products

In livestock production, marketing has an important role. Live animals and related products need useful and proficient market for selling, trading and to carry out any improvement plan and development of industry of livestock especially in rural economies of Pakistan (Younas and Yaqoob, 2008).

5.3.1. Features Determining Livestock Sale on Sample Farms

The main feature of sale of livestock in the research area was urgent monetary need with 40.3 percent this factor was also considered most vital reason for sale in Cholistan desert as indicated by Mariam *et al.* (2012) and Environmental sciences essay UK (2013). The other features of sale of livestock in a decreasing order were sale for Qurbani, maintenance of herd size, falling animal health status, depletion of grazing vegetation, danger of disease incidence, regular animal replacement, depletion of drinking water and living near livestock market as shown in table 6. It is probable that the pattern of livestock sale determining factors is same if these factors will be calculated with the current data.

Table 6: Features determining livestock sale (% score) by species in Thal Desert of Pakistan

Livestock Sale Determining Factors	Buffaloes	Cattles	Camels	Sheep/Goat	Overall
Urgent monetary needs	36.0	45.8	33.9	45.5	40.3
Qurbani months arrived close	6.5	18.9	0.0	25.1	12.6
Danger of disease incidence	12.9	2.5	15.7	0.5	7.90
Falling animals health status	15.3	6.6	14.4	3.3	9.90
Herd size increased a lot/maintenance	13.8	9.9	12.9	8.2	11.2
Depletion of grazing vegetation	5.0	6.0	11.3	10.5	8.20
Regular animal replacement	7.5	9.0	5.6	5.3	6.85
Other	1.3	0.8	6.3	1.0	2.35
Depletion of drinking water	0.5	0.5	0.0	0.7	0.43
Living near livestock market	0.8	0.0	0.0	0.0	0.20

5.3.2. Production and Marketing of Milk and Milk Products

The overall milk production from large ruminant was 8.93 liters in winter and 8.47 liter per day per household. Milk production for small ruminant was 4.91 liter per day. 18 percent milk sold in summer while 14 percent in winter. Prices of milk were almost 15 rupees per liter and the price of desi ghee was 244 rupees for 1 kg¹ as depicted in Table 7. In general livestock sector is tentative than other sectors because of the seasonal variations affect livestock productivity but in the study area variation of prices and production of different dairy products were not too much in winter and summer. It is expected that the milk production status across the groups and overall area is same in the current period to the results presented in the results of the study.

Table 7: Milk Production, Consumption and Dairy Products Prices in Thal Desert of Pakistan

Items	Herd Size Group						Overall	
	Small		Medium		Large			
	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
Buff/cattle milk prod.(lit/hh/day)	4.06	3.62	8.73	9.00	14.3	16.3	8.47	8.93
Sheep/goat milk prod.(lit/hh/day)	1.93	1.93	3.32	3.32	11.8	11.8	4.91	4.91
Total milk prod. (lit./hh/day)	6.00	5.55	12.0	12.3	26.1	28.2	13.3	13.8
Share of sheep /goat milk (%)	32.2	34.7	27.5	26.9	45.4	41.8	36.7	35.5
Milk sold (%)	14	10	18	14	22	18	18	14
Desi ghee prod. (kg/hh/month)	3.00	2.77	6.02	6.16	13.0	14.09	6.78	6.92
Milk price (Rs./liter)	14.8	14.7	13.5	13.7	18.0	18.0	14.8	14.6
Desi ghee price (Rs./kg)	241	240	243	240	250	257	244	243

5.4. Livestock Health Management

As a result of drought 8 units of small ruminant were died however it didn't affected the large ruminant. The total monetary loss on those days was 7500 for sheep and 1200 for goats.

¹ These are the prices prevailed in the study area during 2005-2006

The drought mortality percentage for the small ruminants was 0.25 for sheep and 0.11 for goats and this percentage was 0 for the large ruminants as presented in Table 8.

Table 8: Livestock casualties due to drought on sample farms in Thal Desert

Items	Buffaloes	Cattle	Camels	Sheep	Goats
Population on sample farms (#)	302	840	107	1985	2737
No. of animals Died	-	-	-	5	3
Total monetary loss (Rs.)	-	-	-	7500	1200
Drought mortality percentage	-	-	-	0.25	0.11

5.5. Developing the Livestock Economy of the Thal Desert

Areas of credit requirement were evaluated according to the farmers' point of view. It was found that the main factor of the credit requirement was buying inputs as it was the main factor of expenses of keeping livestock. Credit for animal buying was the second factor of credit requirement. As compared to the other groups small size herders were having keen interest towards obtaining credit for buying animals as to increase their livestock productivity. The some other less important factors of credit need was buying vehicles, consumption purpose and enhancing water availability in a decreasing order.

Table 9: Identification of priority (% mean score) of obtaining institutional credit by livestock herd size groups in Thal Desert of Pakistan

Areas of Credit Requirement	Herd Size Groups			Overall	Sign. Level
	Small	Medium	Large		
Buying Inputs (Food, Feeder Concentrates)	43.2	43.6	47.3	44.3	0.086
Buying Animals	39.7	34.5	34.4	36.1	0.685
Buying Vehicles for Transport	3.02	3.00	9.68	4.91	0.031
Consumption Purpose	2.01	6.74	0.00	3.47	0.064
Enhancing Water Availability	0.00	1.87	0.00	0.77	0.259
Other	12.1	10.8	8.61	10.5	0.095

In Thal farmers were concerned about the training needs to enhance their livestock productivity. The most vital priority of the farmers was disease diagnosis and first aid with 21 percent and small group have more concern about the training for this factor. Percentage ranking of the other priorities of training areas were; improving of crops and fodder production 13.2%, animal fattening 12.6%, animal feed making 11.1%, women training in handicrafts making 8.6%, range management, 7.7%, livestock products handling 7.5%, preservation of grasses 5.9%, Planting 5.8%, rainwater harvesting 4.3% and vocational training of male 1.7% (Table 10).

Table 10: Identification of priority training areas (% mean score) in livestock production by livestock herd size groups in Thal Desert of Pakistan

Areas of Training Requirement	Herd Size Group			Overall
	Small	Medium	Large	
Disease diagnosis and first aid	27.5	18.6	19.4	21.0
Improving crops and fodder production	14.1	12.2	14.1	13.2
Animal fattening	13.2	11.0	14.6	12.6
Animal feed making	11.7	11.1	10.6	11.1
Women training in handicrafts making	8.1	7.9	10.1	8.6
Range management	6.0	9.3	6.5	7.7
Livestock products handling	6.3	7.9	7.8	7.5
Preservation of grasses/ shrubs/feed	4.5	7.0	5.3	5.9
Planting / managing trees and shrubs	3.9	7.6	4.3	5.8
Rainwater harvesting/conservation	2.1	5.5	4.0	4.3
Vocational training of male	0.3	1.5	3.0	1.7
Others	2.4	0.2	0.3	0.7

Among the various socio economic indicators of the development, the herders of the different groups preferred some essential development based factors depend upon their priority and requirement as illustrated in Table 11. Provision of electricity, water, schools was the most important demands for their development (17.5%). Provision of the mobile veterinary services on more frequent basis (13.1%) was another development demand followed by the provision of veterinary medical stores in the interiors (12.4%) and provision of milk collection centers in the interiors (11.3%).

Table 11: Identification of development related demands (% mean score) of sample livestock farmers by herd size groups in Thal Desert

Areas of Development	Herd Size Group			Overall
	Small	Medium	Large	
Provision of electricity, schools etc.	23.7	15.3	14.4	17.5
Provision of mobile veterinary service on frequent basis	13.8	13.3	12.2	13.1
Provision of veterinary medical stores in the interiors	10.2	13.5	13.2	12.4
Provision of milk collection centers in the interiors	9.13	11.3	13.4	11.3
Increased provision of water for livestock and irrigation	13.4	9.13	8.13	10.7
Provision of vaccination facilities at low prices	6.90	9.00	6.50	7.68
Provision of mobile rescue services for animals & human	6.70	7.63	7.11	7.22
Provision of metaled/semi-metaled roads in the interiors	4.87	5.45	7.74	5.94
Provision of teaching staff in schools	5.07	5.86	6.50	5.82
Provision of food reserves for unexpected droughts	3.25	4.77	5.67	4.54
Provision of fodder reserves for unexpected droughts	3.04	4.77	5.37	4.42

6. Conclusion

The main outcomes of the study are as follows.

- Regarding livestock composition, on average single livestock farming household consist of 22 goats, 16 sheep, 7 cattle, 2 or 3 buffaloes, donkeys 0.21 and 0.05 mules. On average a single livestock farm consists of about 17 standard animal units.
- Separate grazing method for small and large ruminants was most common in the region. Breeding sires and productive livestock were generally stall-fed with green fodder, wheat straw and other concentrates.
- Natural breeding was preferred than artificial insemination for reproduction of livestock by the livestock holders.
- For breeding purpose the selected bull was managed by most of the livestock holders to get better quality of livestock.
- Regarding livestock marketing urgent monetary need was the main cause of livestock sale.
- Total milk production was 13 liter per day by a single household. 18 percent milk sold in summer and 14 percent of total milk production was sold by a single livestock holder household in winter. The price of milk was recorded as 14 rupees per liter

- The principal objectives of the livestock farming were milk production for home consumption for cattle and buffaloes. Camels were reserved for sale as load/pack animals and ride animals and the primary objective for keeping small ruminants were sale as young stock and adult animals.
- On behalf of identification of development related demands it was examined that the provision of electricity was primary requirement of livestock holders of the Thal.
- For detection of priority training areas for the development purpose, it was found that the disease diagnosis and first aid was the top area regarding training requirement.
- For assessing the main areas of credit requirement, it was found that buying inputs and live animals were the main areas for credit requirement.

7. Recommendations

To increase the production of livestock and the productivity per animal in the area for the overall development of livestock farming in Thal desert, the following are the suggestions:

- For improving the genetic potential of local livestock breeds, artificial insemination should be popularized along with offering the services of sires during breeding seasons. Side by side, the local communities should be encouraged to learn managing pedigree records of their animals to use it for getting premium prices for their animals.
- Government should also encourage people in different ways for example by distributing prizes to people who have large size of livestock .
- It is also suggested that vaccine insemination must be ensured to the animals by herders as well as government organizations to protect livestock from diseases.
- Since majority of the livestock farming households have small sized herds and they are relatively more sufferer of various production and marketing problems pertaining to both the crop and livestock products (live animals and milk). It is therefore suggested that the development planners and practitioners of the area should award due consideration to the problems of small sized farmers and herders.
- There is also a strong need to design some regulatory framework for milk and livestock marketing systems in order to increase due returns of the farmers' effort and attracting investment in livestock farming on commercial lines. Popularizing sale-purchase of live animals is one of policy measures need to be implemented for slaughter purpose animals as early as possible in livestock markets of the country.
- Various improved methods (e.g. use of electronic and print media, making farmers organizations etc.) may be used for creating awareness among farmers of Thal desert along with efforts of social mobilization and promoting local participation in development activities.
- The institutional credit facilities should be provided to the farmers in the areas for installing tube wells where underground water is suitable for irrigation. However, to improve feed and fodder security, the cultivation of water guzzling crops like rice or sugarcane and cash crops like cotton should be discouraged in favour of promoting the cultivation of fodder

crops, alpha alpha, mott grass, Sudan grass etc. Local communities should be mobilized for re-plantation of fast growing fodder trees, shrubs and grasses.

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