Research Article

CrossMark
click for updates

A Perspective on Household Dairy Farming in District Naushahro Feroze, Sindh, Pakistan

Israr Yasin[1], Ismail Qureshi[1]*, Shahjahn Qaimkhani[1], Gulam Mustafa Solangi[3], Ismail Qaimkhani[1], Ismail Brohi[1] and Abdul Ahad Soomro[2]

[1]Faculty of Animal Husbandry and Veterinary Sciences, Sindh Agriculture University, Tandojam, Sindh, Pakistan; [2]Central Veterinary Diagnostic Laboratory (CVDL) Tandojam, Sindh, Pakistan; [3]Vaccine Production Unit (VPU) Tandojam, Sindh, Pakistan.

Abstract | A household survey was conducted to collect the information on household dairy farming with special reference to management of livestock, milk production and marketing as well as role of livestock in household income in district Naushahro Feroze of Sindh-Province Pakistan. Six hundred households were selected from 40 villages in four out of nine Talukas (administrative units) using multistage clustering method. Estimates of the study revealed that 54% of the households possessed buffaloes. Average number of buffaloes was estimated at 4.28 while 376 (63%) of the household reported cattle with average number of 4.38 heads per household. Small numbers of buffalo and cattle bulls were recorded. Average number of 5.55 goats per households was reported by 35% of all the households. On an overall basis, 2,365 liters of buffalo milk was computed from 600 households, while 1,033 liters (43.7%) was used in households and 1,332 (56.3%) liters was sold. About 1,868 liters of cow milk were computed from 600 households, while 915 liters (49%) of milk used in households and 953 (51.0%) liters were sold. Majority of houses supply milk to milk collection agents (72.0%), while the most prevalent mode of payment was recorded on weekly basis (73%). About 66.0% of the respondents reported that they contact veterinary doctors. Relatively more proportion (39.0%) of abortion was estimated for the households who used Oxytocin before milking of animals. Using chi-square statistic, the relationship between use of Oxytocin and abortion in large animals was found highly significant (p<0.01). On an average basis, 3.0% growth rate in livestock was estimated. The highest growth rate (5.0%) was recorded in buffaloes. Livestock contributed about 21.0% to household income (sale of milk 11% and sale of animals 10%). Relatively more proportion of females was recorded in livestock rearing (44.6%); followed by skilled labor (handicrafts: 28%), and agriculture (12.1%).

Introduction

Dairy farming plays a pivotal role in providing food security in Pakistan. The majority (70%) of the farmers are dairy holders possessing up to 10 animals (Khan *et al.*, 2013). Livestock sector provides employment to 45% population and majority of them are living in rural settlements and also provides inputs for agro-based industry. It's also provides high quality food for human consumption. Livestock has

share of approximately 55.1% of agriculture GDP value added 23% in 2009 and 11.5% during 2010-11 (Anonymous, 2010). Current livestock-population of the country includes 31.7 million buffaloes, 35.6 million cattle, 28.1 million sheep, 61.5 million goats and 1 million camels (Anonymous, 2010). Livestock has been appeared as subsistence sector dominated by small holders to fulfill their needs of milk, food and cash income on daily basis. In the rural areas, livestock is considered as a more secure source of income for the small farmer and landless poor people (Hasnain and Usmani, 2006).

Milk marketing is gaining importance in Pakistan due to attractive prices of milk, especially after induction of food companies' viz. Nestle, Engro-foods and Haleeb.

Pakistan is producing billion liters (BL) of milk productions according to economic survey of Pakistan 2017-18 buffalo 35.136 (BL), cow 20.903 (BL), sheep 0.040 (BL), goat 0.915 (BL), camel 0.896 (BL) total 57.890 (BL) milk production whereas, human milk consumption is 46.682 (BL). The value of total milk production is much higher than that of major crops of the country viz. wheat and cotton (Ali et al., 2011). Since agriculture is a risky business and vulnerable to weather, therefore, income of farmers varies dramatically from seasons to season and bankruptcy is a common phenomenon especially during cropping season in developing countries. However, livestock provides an economic-safety shield to farmers from poverty menace (Khan et al., 2013).

Naushahro Feroze is one of the poor district of the Sindh province of Pakistan in terms of development indicators. Being a lower riparian, the district is facing water shortage, hence, natural livelihood options have depleted during the last many years. In this situation, livestock is one of the major economic sources of livelihood of the people. The study was conducted to estimate the number of animals, milk production, domestic consumption and sale, record management and facilities in livestock farming, estimate contribution of livestock income to total household income, and explore the female contribution in household dairy farming in the district.

Materials and Methods

The design of this research was the descriptive survey and the purpose was to collect in-depth information about livestock and its contribution to total income of the households of rural settlements of district Naushahro Feroze. According to Cohen and Manion (1980) and Trochim (2000), a descriptive survey design is appropriate for obtaining people's perceptions of social issues and facts concerning the current status of phenomena and/or for describing the nature of existing conditions in a situation.

The design of this research was descriptive survey and the purpose was to collect in-depth information about livestock and its contribution to the total income of the households of rural settlements of district Naushahro Feroze. According to Cohen and Manion (1980) and Trochim (2000), a descriptive survey design is appropriate for obtaining people's perceptions on social issues and facts concerning the current status of phenomena and/or for describing the nature of existing conditions in a situation.

The targeted population of the study was rural settlements of district Naushahro Feroze. Hence, the estimates reflect the information about livestock in rural settlements of district Naushahro Feroze. A randomization technique was adopted, while selecting villages and households.

Study area and samples collection

Out of nine (9), four (4) talukas were purposively selected covering the agro-ecological zones. The randomly selected talukas were Bhiria City, Moro, Kandiaro, and Mehrabpur. Description of agro-ecological zoning of the selected taluka scan be reported as Moro being coastal area, Bhiria City having advantage of main highway to Karachi, Bhiria taluka representing rocky area (Jalbani side), and Mehrabpur as agriculture based taluka. A sample of 600 households was selected from four (4) talukas as mentioned above with an equal number of households (150) from each taluka. A multistage-cluster sampling was applied to select households. In the first stage, 40 villages were selected (10 villages from each taluka) and in second stage, 600 households were selected from 40 villages (averagely 15 households from each village). Randomization was done to select villages and households using systematic sampling whereby every k item is selected.

Personal interviews were conducted to collect the required information on a structured questionnaire. Data were collected by 4 Enumerators. The total time taken to interview a respondent was estimated 45 minutes. About 30 questionnaires were filled in a day. Thus, the survey was completed in about 20 days. Statistical Package for Social Sciences (SPSS, Version 17) was used to analyze the data. Descriptive and inferential statistical methods were used to analyze the data. Descriptive methods included arithmetic mean, frequencies, percentages, and totals while using inferential statistics multiple linear regression models was used to explore determinants of milk production. The stepwise regression method was applied to select significant independent variables. Before running regression, the traditional level of significance at 5% was decided to include the variables in the proposed model.

Results and Discussion

Table 1 reveals the households possessing buffaloes on an overall basis, 323 households (54%) possessed buffaloes. Average number of buffaloes was estimated at 4.28. Thus total number heads of buffaloes were recorded at 1,383. Average number of adult buffaloes were recorded at 2.72 per household in 306 households (51%) while the average number of milking buffaloes was estimated at 1.73 in 259 households (43%). Thus, total number of buffaloes was estimated at 831 while milking buffaloes were 448, which is equivalent to

54% while rest of the buffaloes (46%) were attributed as dry. Cattle were reported in 376 (63%) households with average number of 4.05 heads per household. Like buffaloes, a small numbers of bulls were recorded. Total number of buffalo bulls was only 13. Number of adult cows was estimated 808, while milking cows were 503; which is equivalent to 62% of adult cows.

Table 1: *Households possessing buffaloes and cattle in 40 selected villages of 4 talukas of district Naushahro Feroze, Sindh.*

Animals			% (n=600)	Mean	Sum
Buffa-loes	Total		54	4.28	1383
	Bull		1	1.40	7
	Calves		34	1.93	390
	Heifers		16	1.61	155
	Adult Buf-faloes	Total	51	2.72	831
		Milking	43	1.73	448
Cow	Total		63	4.05	1522
	Bull		1	1.63	13
	Bullocks		7	1.85	74
	Calves		38	2.14	486
	Heifers		14	1.7	141
	Cow	Total	58	2.34	808
		Milking	49	1.73	503

Total number of goats was estimated at 1,165 with average number of 5.55 heads per households as reported by 210 households, equivalent to 35% of all the households surveyed (Table 2). Only 146 sheep were recorded in 15 households (2.5%). Segregated data reflected that only 7 rams were enumerated in only 3 households and 96 ewes were observed in 14 households, while 43 lambs were recorded in 9 households. The average number of ram, ewe, and lambs per household was estimated at 2.33, 6.86, and 4.78, respectively.

Table 2: *Households possessing goats and sheep in 40 selected villages of 4 talukas of district Naushahro Feroze, Sindh.*

Animals		% (N=600)	Mean	Sum
Goats	Total	36	5.55	1,165
	Buck	06	2.36	78
	Doe	32	3.43	656
	Kid	24	2.95	431
Sheep	Total	3	9.37	146
	Ram	1	2.33	7
	Ewe	2	6.86	96
	lambs	2	4.78	43

Milk production, domestic consumption and sale Table.

Table 3: *Milk production, consumption and sale in 40 selected villages of 4 talukas of district Naushahro Feroze, Sindh.*

Milk		N	Mean	Sum	%
Buffalo	Total	259	9.06	2365	100.0
	Domestic consumption	251	4.12	1033	43.7
	Milk sold	190	7.01	1332	56.3
Cow milk	Total	291	6.49	1868	100.0
	Domestic consumption	270	3.39	915	49.0
	Milk sold	188	5.07	953	51.0

Table 3 presents the buffalo milk production, consumption and sale. About 2,365 liters of buffalo milk was computed from 600 households while 1,033 liters (44%) was used in household while 1,332 (56%) liters was sold. Likewise, 1,868 liters of cow milk was computed from 600 households while 915 liters (49%) were used in household while 953 (51%) liters were sold. Zia (1997) suggested that higher milk production can be obtained by providing clean and good housing to animals. The animal should be facilitated with drinking water. Sheds of the animals should be well ventilated with protection of the animals from extreme temperatures and strong winds. There should be proper drainage system to keep hygiene at the farm. It consists of a built up animal shed, a brick soling paddock for animals, calving pens in which pregnant animals are kept separated from other animals before calving, one room for milk storage, one room for storing farm equipment and one for compound feed storage.

Table 4: *Area (sq. ft) of livestock sheds in 40 selected villages of 4 talukas of district Naushahro Feroze, Sindh.*

Type of area	Normal	Minimum	Maximum	Mean
Uncovered area	200	50	120,000	1,655
Covered area	494	50	60,000	1956

Table 5: *Cross-tabulation of association between use of oxytocin and abortion in 40 selected villages of 4 talukas of district Naushahro Feroze, Sindh.*

			Abortion in large animals		Total
			Yes	No	
Use of oxytocin	Yes	N	105	164	269
		%	39.0	61.0	100.0
	No	N	45	253	298
		%	15.1	84.9	100.0
Total		N	150	417	567
		%	126.5	73.5	100.0

Chi-square = 61.6 ** (Highly significant)

Association of use of oxytocin with abortion Table 5 shows association of use of oxytocin and abortion. On an overall basis, 26.5% of the respondents reported abortion in large animals. Relatively more proportion (39.0%) of abortion was estimated for the households who used oxytocin before milking of animals. Using chi-square test, the relationship between use of oxytocin and abortion in large animals was found highly significant (p<0.01).

Table 6: *Growth trends in livestock during one year in 40 selected villages of 4 talukas of district Naushahro Feroze, Sindh.*

Type	Buffalo	Cow	Goat	Sheep	Overall
Last year	100	100	100	100	100
Slaughtered died	2.4	2.3	2.8	2.6	2.5
Sold	6	5.5	10.6	2.6	7
Newborn	7.1	9.8	8.6	16.4	8.8
Purchased present	19.5	18.5	22.3	16.4	19.8
	1	2.1	0.8	1.3	1.3
	104.9	103.1	101.1	96.1	102.8
Overall growth %	4.90	3.10	1.10	-3.9	2.80

Growth trends in livestock during one year Growth. Trends in livestock during one year are shown in Table 6. On an average basis, 3.0% growth rate in livestock has been estimated. The highest growth rate (4.9%) was recorded for buffaloes, followed by cows (3.10%) and goats (1.10%) while sheep are decreasing at 3.90%. Highest mortality rate was reported for goats (10.60%), followed by buffalo (6%), cow (5.5%) and sheep (2.6%).
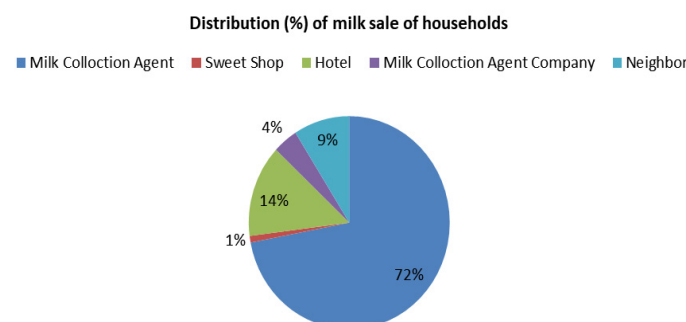

Figure 1: *Depicts the distribution of milk sale by households. On an overall basis, majority of houses supply milk to milk collection agents (72%), followed by hotels (14%), neighbors (9%), milk collection agents of companies (4%) and sweet shops (1%).*
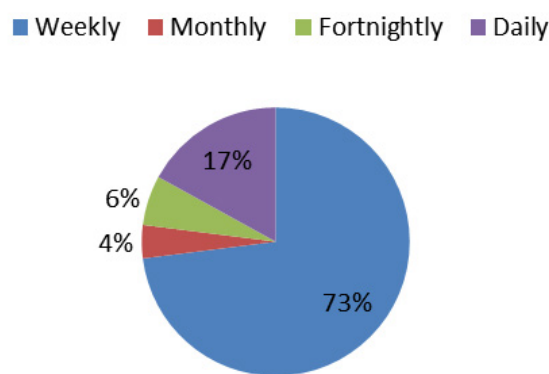

Figure 2: *Represents the mode of payment of various purchasers of milk in district Naushahro Feroze. On an overall basis, the most prevalent mode of payment was documented on weekly basis (73%), followed by daily (17%), fortnightly (6%), and monthly (4%). Majority of sweet shops (63%) preferred to clear payments on daily basis. All milk companies make payment on weekly basis. Barring sweet shops, all the purchasers of milk pay their dues on weekly basis.*

Livestock sheds
About one third (34%) of the
households reported the livestock shed facility.
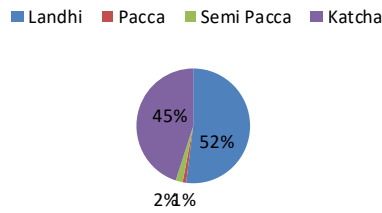
- ■ Landhi ■ Pacca ■ Semi Pacca ■ Katcha

Figure 3: *Reveals the distribution of livestock sheds by type. Landhi (made of wood and straw) was reported as more than one-half (52%) of all the livestock sheds. Proportion of katcha sheds (made of mud) was estimated 45%, whereas pacca and semi pacca sheds were 1 and 2%, respectively. Table 4 shows the area of livestock sheds. Average uncovered area of livestock sheds was reported to be 1,655 sq feet while average covered area was 1956 sq feet with minimum and maximum shed area of about 50 and 60,000 sq feet, respectively. Majority of the respondents reported that the livestock is tethered by chain under trees outside their houses.*

Basic Information about vaccines

- ■ Know Names Of Vaccines ■ Availability of Vaccination
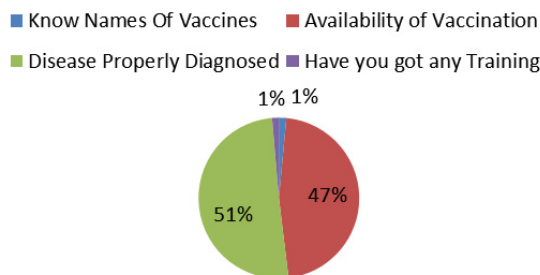- ■ Disease Properly Diagnosed ■ Have you got any Training

Figure 4: *Summarizes information regarding respondents' perceptions about vaccines. A very small number (2.4%) of the respondents knew the names of vaccines. Majority (75.3%) of the respondent shared information that vaccines are available in the market. Likewise, quite a large proportion (81.7%) of the respondents reported that diseases are properly diagnosed. However, quite a small number (22%) of the respondents agreed that proper rates are charged. Only 2.2% of the respondents reported that they have got any training in livestock vaccination.*

Source of treatment of sick animals

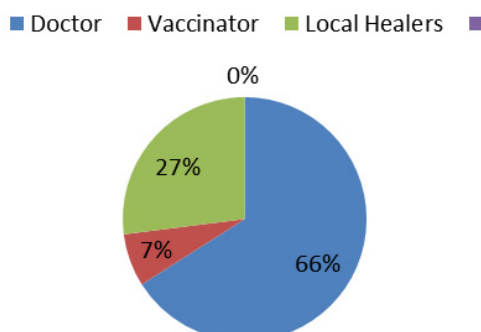- ■ Doctor ■ Vaccinator ■ Local Healers ■

Figure 5: *Unveils the source of treatment of sick animals. About 66% of the respondents reported that they contact veterinary doctors while 27% with local healers and only 7% with vaccinators. Local healers were found active in Moro where almost half (47%) of the respondents nominated local healers as a source of treatment for their sick animals.*

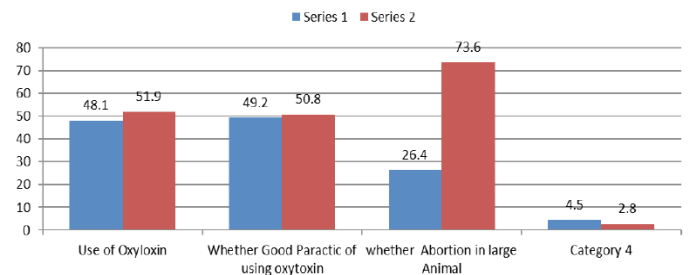**Livestock farmer's perceptions regarding use of oxytocin**

- ■ Series 1 ■ Series 2

Figure 6: *Less than half (48.1%) of the respondents reported that they use oxytocin before milking (Figure 6). Trend of using oxytocin was relatively higher in Moro where 49.2% of the respondents reported use of this milk letdown hormone. Almost half of the respondents called it (i.e use of oxytocin) a good practice. About one fourth (26.4%) of the respondents reported abortion in large animals.*
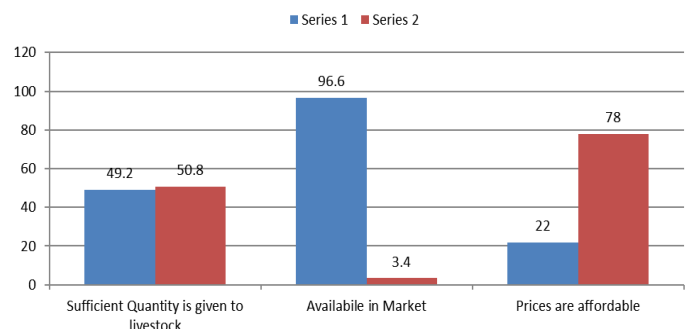
- ■ Series 1 ■ Series 2

Figure 7: *Summarized information concerning livestock farmer's perceptions (%) about feed has been displayed in.*
About half (49.2%) of respondents were of the opinion that sufficient quantity of feed is given to livestock. On the other hands, quite a large proportion (96.6%) of the respondents reported that feed is available in the market. However, only 22.0% of the respondents stated that prices are affordable. It was concluded that in certain cases livestock feeds are available, but beyond the purchase of an ordinary livestock farmers due to lack of money.

Distribution of income by profession in 40 selected villages of 4 talukas of district Naushahro Feroze, Sindh

- ■ Agricultural Crops ■ Unskilled ■ Sale of Milk
- ■ Sale of Livestock ■ Govermrnt of service ■ Skilled Labor
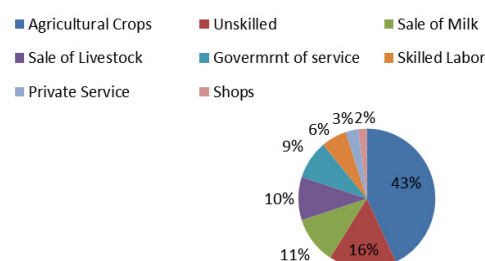- ■ Private Service ■ Shops

Figure 8: *Contribution of livestock in household income. Average monthly income of a household was about Rs. 19,000 with standard error of the mean of about Rs 960. Reveals the distribution of income by profession. About 43% of the income was estimated form agricultural crops. Income of unskilled labor contributed about 16%, and was ranked as the second major source of income. Income earned from "sale of milk" and "sale of livestock" was ranked as the third and fourth source of income accounting for about 11% and 10%, respectively. Collectively, livestock contributed about 21% to household income. Share of income from government services was 9% followed by skilled labor (6%), private service (3%), and business and shop (2%).*
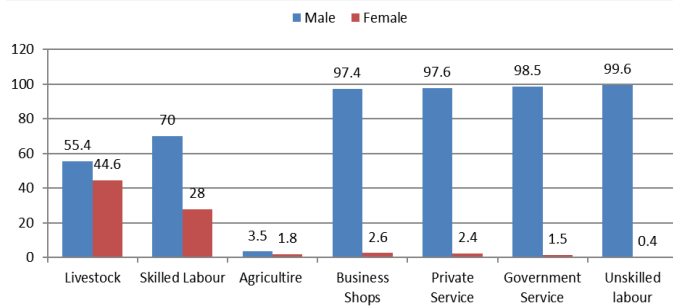
Figure 9: *Labor Force by Gender in 40 selected villages of 4 talukas of district Naushahro Feroze, Sindh. Labor force by gender. Figure 9 shows the labor force by gender. Very small contribution of females was recorded in service and business professions. However, relatively more proportion (44.6%) of females was recorded in livestock rearing followed by skilled labor (handicrafts: 28%), Agriculture (1.8 %), business shops (2.6%), Private services (2.4%) and government service (1.5%).*

Suggestions

Based upon estimates collected through this study and observations recorded during survey, the following suggestions are furnished. Milk processing companies should be encouraged to install chillers and purchase milk from remote areas of district Naushahro Feroze. Veterinary Departments of Provincial Government and NGOs should facilitate each other in the development of livestock, diagnosis of disease, supply of vaccines, and awareness campaigns. There should be district wise epidemiological units, so they can predict and estimate the actual magnitude of disease threats and prepare a proper strategy to combat contagious and zoonotic diseases. Awareness campaigns should be started against the use of oxytocin in milking buffaloes.

Conclusion

It is a matter of fact that dairy farming plays a significant role in moving the economy wheel of rural households. In this regard, this study was conducted in district Naushahro Feroze district of Sindh province of Pakistan to estimate the contribution of small dairy farming in household incomes. Estimates of this study were inferred to whole districts computed from a sample of 600 farmers selected from 40 villages in four out of nine talukas based upon agro-ecological zones. Cattle and Buffaloes were preferred and possessed by 63 and 53% of households. Milk from cattle and buffaloes was a major source of food and income generation since half of the milk produced was used as household consumption while the remaining half was sold in local market. Livestock contributed about 21% to household income (sale of milk 11% and sale of animals 10%). Milk collection agents (73%) were reported to be major milk selling channel of these small dairy farmers. The negative impact of oxytocin was recorded since 39% of abortion was estimated for the households who used oxytocin before milking of animals.

Data analytical

M stat-c and MS excel, software were used for data analysis and making graph and tables.

Authors Contribution

IY, IB, IQ were the data collector and conducted the research work from different dairy farms whereas, IQ was advisor and wrote the manuscript, designed study analyzed data, variations and conduct mean values and whereas, SQ and GMS were financially supporters.

Conflict of interest

The authors have declared no conflict of interest.

References

Afzal, M. and Naqvi, A.N., 2004. Livestock resources of Pakistan: Present status and future trends, quarterly science vision. 9: 1-2.

Ahmad, Z., Khan, M., Khan, M.S. and Ahmad, M.D., 1989. Effect of season on postpartum fertility parameters in Sahiwal cows. Pak. J. Agric. Sci., 26: 118-124.

Ali, I., Tariq, M.M., Bajwa, M.A., Abbas, F., Isani, G.B., Soomro, G.H., Waheed, A. and Khan, K., 2011. A study on performance analysis of Holstein-Friesian cattle herd under semi-intensive management at Pishin dairy farm Balochistan. Igdir Univ. J. Inst. Sci. Tech., 1: 35-57.

Ali, T., 2000. Pakistan. A case study of milk production and marketing by small and medium scale contract farmers of Haleeb Foods Ltd, Markets Innovative Practice series, IIED,

London.

Akram, M., 1990. Pakistan, animal feed resources in Asia and pacific. Asian productivity organization, Tokyo.

Anjum, M.S., Lodi, K., Raza, A.A., Walters, F. and Krause, S., 1989. Pakistan's dairy industry: Issues and policy alternatives. The economic analysis network project/USAID/394-0491-C-00-5035 Islamabad, Pakistan.

Anonymous, 1999. Government of Pakistan, ministry of food agriculture and cooperatives, food and agriculture division, Islamabad, Pakistan.

Anonymous, 2000. Government of Pakistan, finance division, economic advisors wing, Islamabad.

Anonymous, 2002. Government of Pakistan economic, finance division, economic advisory wing, Islamabad.

Anonymous, 2010. Government of Pakistan, finance division, economic advisors wing, Islamabad.

Bilal, M.Q. and Ahmad, A., 2004. Dairy hygiene and disease prevention, Usman and Bilal printing linkers, Faisalabad.

Bilal, M.Q. and Sajid, M.S., 2005. Meeting milk demand (The only way is to modernize dairy farming). The Nation. pp. 26.

Bilal, M.Q., Sajid, M.S. and Iqbal, M.U., 2005. Debate whether oxytocin is dangerous for dairy animals and human health. Nation October, 16: 26.

Burki, A.A., Khan, M. and Bari, F., 2005. The state of Pakistan's dairy: An assessment, CMER Working Paper, 05-34, LUMS, Lahore.

Bulla, R.J., Lichtenberg, V.L. and Holt, D.A., 1977. Potential of the world's forages for ruminant animal production. Winrock international livestock research and training centre petit jean mountain moniliton, Arkansas, USA.

Chaudhry, M.A., 2002. Progeny testing program for buffaloes in Pakistan. D-8 International seminar on conservation of animal genetic resources, Islamabad, Pakistan.

Crowder, L.V., 1988. Fodder crop research in Pakistan: A Review. PARC/USAID/MART-Win rock, USA.

Cohen, L. and Manion, L., 1980. Research methods in education. Croom Helm: London.

Dahlin, A., 1998. Genetic studies on Sahiwal cattle in Pakistan. Doctoral thesis, Swedish university of agriculture sciences, Uppsala, Sweden.

Farooq, M.K. and Qudoos, A., 1999. Constraints in

the Adoption of Modern Livestock Practices. Pak. Vet. J., 19(1): 53-55.

FAO, 1998. Production yearbook Food and Agriculture Organization, Rome, Italy.

Garcia, O., Mahmood, K. and Hemme, T., 2003. A review of milk production in pakistan with particular emphasis on small-scale producers. PPLPI Working Paper: No. 3. Rome: Food and agriculture organization of the united nations.

GoP, 2009. Economic survey 2008-09. Islamabad: Ministry of Finance.

Habib, G., Hameed, A. and Akmal, M., 2007. Current feeding management of Peri-urban dairy buffaloes and scope for improvement. Pak. Vet. J., 27(1): 35-41.

Hanjra, S.H., David, J.B. and Akhtar, M.J., 1995. Fodder production. FAO, pak/88/072. Small dairy holder dairy development in Punjab, Pakistan.

Hasnain, H., 1983. Feed-the key to more food in Pakistan. Proc. FAO PARC Workshop on Least Cost Formulation, Islamabad.

Hasnain, H.U. and Usmani, R.H., 2006. Livestock of Pakistan. Livestock foundation, Islamabad, Pakistan.

Iqbal, M. and Ahmad, M., 2002. An assessment of livestock production potential in Pakistan: Implications for livestock sector policy. Pak. Dev. Rev., 38(4): 615-628. https://doi.org/10.30541/v38i4IIpp.615-628

Jalil, H., Rehman, H.U., Sial, M.H. and Hussain, S.S., 2009. Analysis of milk production system in peri-urban areas of Lahore (Pakistan) a case study. Pak. Econ. Soc. Rev., 47(2): 229-242.

Khan, M.J., Abbas, A., Naeem, M., Ayaz, M.M. and Akhter, S., 2013. Current issues and future prospects of dairy sector in Pakistan. Sci. Tech. Dev., 32(2): 126-139.

Khan, B.B., Sial, M.A. and Gilani, A.H., 1988. Livestock feed resources and requirement scenario of Pakistan. Dairy production potential and challenges. Proc. Natl. Seminar held in Faisalabad.

Khan, M.S., Chaudhary, M.A. and Bhatti, N.M., 1999. Progeny testing Nili-Ravi buffalo-Ranking of bulls for first six batches. Buffalo Newsl., 13: 1-5.

Khan, M.S, Ahmad, N. and Khan, M.A., 2007. Genetics resources and diversity in dairy buffaloes of Pakistan. Pak. Vet. J., 27(4): 201-207.

Khan, U.N., 1994. Genetic improvement of native cattle through crossbreeding and introduction of exotic dairy cattle in Pakistan. Islamabad: Pakistan science foundation.

Leng, R.A., 1991. Improving ruminant production and reducing methane emissions from ruminants by strategic supplementation. Publication of US environmental protection agency (EPA/400/1-91/004), USA.

Qamar, M.K., 2004. Demand for services planning by villagers. A case study from Pakistan. Annual meeting of Neuchatel Initiative Group, held at Aarhus, Denmark.

Raza, S.H., 2000. Role of drought animals in the economy of Pakistan. Drought Anim. News, (32): 17-18.

Raziq, A., Younas, M. and Rehman, Z., 2010. Prospects of livestock production in Balochistan. Pak. Vet. J., 30(3): 181-186.

Riaz, M.N., Malik, N.A., Nasreen, F. and Qureshi, J.A., 2008. Molecular marker assisted study of kappa-casen gene in Nili-RaviI (buffalo) Breed of Pakistan. Pak. Vet. J., 28(3): 103-106.

Sarwar, M. and Zia-ul-Hassan. 2001. Nutrient metabolism in ruminants. Univ. Press Univ. Agric. Faisalabad, Pakistan.

Sarwar, M., Khan, M.A. and Iqbal, Z., 2002. Feed resources for livestock in Pakistan. Int. J. Agric. Biol., 1: 186-192.

Trochim, W., 2000. The research method knowledge base, 2nd edition. Atomic Dog Publishing, Cincinnati, OH.

Ullah, E., 1998. The study of small holders milk production in the central Punjab and strategies for an effective development approach. MSc Thesis, Dep. Livest. Manage., Univ. Agric., Faisalabad.

Usmani, R.H. and Shah, S.K., 1986. Establishment of nucleus jersey herd for the improvement of non-descript cattle of Barani areas in Pakistan. Islamabad: Pakistan Agricultural Research Council.

Winfried, S., 1999. Intensification of animal husbandry effect on global warming and soil quality. Anim. Res. Dev., 49: 8-13.

Zia, U., 2007. Improved market access and smallholder dairy farmers' participation for sustainable rural development. Asia Dairy Farming, 5: 234-240.