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Livestock Sector as Income Source to Mitigate Energy Crisis, with the Emphasis on Pakistan

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Abstract: Livestock plays multi-faceted role in the rural life by providing food, income, employment, transportation and draught power. Moreover, it is also the source of renewable energy and fertilizer in replacement of chemical fertilizer. In addition livestock plays vital role in food security issues and poverty alleviation. In this perspective, present study was focused to identify the role of livestock as a sustainable income source of the farmers and potential as renewable energy source. Study was confined to 120 randomly selected livestock growers of Sub DistrictNankana Sahib of Province Punjab, Pakistan. Collected data were analyzed using Statistical Package for Social Science (SPSS); in addition, descriptive as well and inferential statistics was applied for the meaningful interpretation of data. Findings indicated that young aged respondents' percentage was prominent while educational level of the area was below mark as one fourth was illiterate. Meanwhile, livestock and crops farming together appeared as most prominent income source. Income generated through livestock was helping in fulfillment of respondents' daily life needs. Purpose identified by respondents of livestock was also to fulfill their daily needs and family development. Informal discussion revealed that respondents were not having inclination toward bio-gas which could me more productive. It is dire need of popularizing the advantages of bio-gas to boost the adoption which will not only help farmers but also the country which is already indulged in heavy energy crisis.

Key words: Livestock · Energy Crisis · Income Source

INTRODUCTION

Livestock is an important sub-sector of Pakistan's agriculture which is playing a vital role in the development and economic growth of the country. It contributes 55.1% in agriculture value addition that is much more than those of the crop sector [1]. Milk and meat are the two important sub sectors of livestock. Pakistan is the 3rd largest milk producing country with annual production of 47 billion liters [2]. Pakistani meat is one of the important livestock products that are being exported to many countries of the world. Export of live animals also adding about 13.95 million US dollar every year to country's economy [3]. Pakistan is also a renowned exporter of finished leather goods. Export of finished leather has reached to 340.80 million US dollars in 2010 which is 39.40% 0f total exports of Pakistan [4].

Livestock is a sustainable source of income; sustainability refers to the continuous improvement of present without harming the future. As reported by Kuhlman and John [5] that sustainability is a concept that leads human beings towards continuous betterment in thesocial, economic and environmental conditions specially for poor farmers. Livestock generates direct benefits to the poor farmers with an annual growth rate of 4-5% [6]. Moreover, indicated livestock as a sustainable source of income with a growth rate of 6.1% per annum in livestock income during last decade.

Livestock is a source of income, employment and alleviation of poverty for rural masses. Livestock join together with farming system, as safety deposit for crucial circumstances [7]. Livestock generates income for 675 million of farmers and about 20 million farm families round the globe who are fully dependent upon livestock and crops for their income and livelihood. Livestock is a

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multipurpose sector; it fetches food, generates income, produces employment, gives fuel and fertilizer (animal dung), provides transportation and draught power and brings economic stability [8]. Moreover it is a multidimensional source of income, as income could be generated by sale of milk and animals to meet the daily family needs, emergency needs and to buy agriculture inputs. Apart from these, income is also generated by the sale of meat, bones, fat, blood, hairs and hides [9].

Energy is necessary element for the development now days and when we talk about Pakistan quickly the energy crisis comes in mind as from many years Pakistan is indulged in worst energy crisis. These energy crises are not only affecting the development but also the prosperity of entire nation. Major problem in Pakistan is expensive generation of electricity on crude oil. In this perspective, renewable energy is the most viable solution which is available with definitive potential. Among the several renewable energy sources Bio-gas is noticeable for the development of local level. In country huge potential exists as Pakistan is agricultural country and livestock counts enough proportion. The amount of animal waste could create enough biogas for the national consumption by little efforts.

Taking in consideration the above mentioned importance of livestock present study was conducted to know about the role of livestock as a source of income for the farmers in District Nankana Sahib, so that the role of livestock as a sustainable source of income could be highlighted and appropriate measures could be suggested for the improvement and betterment of this sector. The big goal of this study was:

- To identify the total number of livestock kept in the study area by the respondents
- To explore the purpose of livestock farming along with needs of farmers being fulfilled by the income generated through livestock
- To highlight the importance of livestock as renewable energy source on the base of findings and hidden potential of livestock.
- To investigate the constrains hindering the livestock productivity

MATERIALS AND METHODS

Sampling Procedure and Sample Size: Sub-District Nankana Sahib comprised of total 37 union councils. Out of total 37 union councils, 34 were rural union councils. Form the 34 rural union councils out of which, 4 councils were randomly selected for the study. From each council, 3 villages were randomly selected. 10 livestock farmers were selected From each village making a sample size of 120 respondents. All he selected respondents were typically livestock farmers.

Research Instrument: Interview Schedule was used as interview schedule. Interview schedule was structured and validated. Research instrument was first tested on 10 livestock growers for the reliability and validating assessment of instrument. Later on appropriate changes were made by the consultation of livestock experts.

Data Collection: Data were collected through personal interviews while personal observations were also carried out along with. Farmers were approached at their farms and homes for the interviews. 5 point Scale was used for the perceived responses. Aggregate mean of scale was estimated as 3 so, in this regard the mean value attained by any parameter enlisted in research instrument, if, is greater than 3 it is rated as important while if attained mean is lower than 3, then it is ranked as less important.

Data Analysis: Collected data were analyzed through SPSS (Statistical Package for Social Sciences). Descriptive as well as inferential statistics was applied for the meaningful interpretation of data.

RESULTS AND DISCUSSION

Demographic Characteristics of the Respondents: The data depicted in Table 1 clearly indicate that among the respondents, young aged were prominent with significant percentage of 37.9. Almost one third of the respondents (32.1%) were falling in old aged category along with 30% medium aged farmer respondents. It sounds pretty good that young people had their inclination toward crop and livestock farming. Meanwhile it also creates critics that the livelihood of these people will not be good in rural areas and also they have slight chances of their development just because of having opportunities of substandard. This issue was somewhat proved by the inadequate literacy level as almost one fourth (23.3%) respondents were found illiterate having no formal education. While 76.7% respondents were found having formal education. Further distribution of the educated respondents indicate that only 29.1% respondents were having education more than matriculation level which is not quite good for the

Table 1: Distribution of respondents according to their Demographic Characteristics

Demographic Characteristics		Frequency
Age (years)	20-35 (Young)	45 (37.9)
	36-50 (Medium)	36(30.0)
	Above 50 (Old)	39(32.1)
Education	Illiterate	28(23.3)
	Primary	24(20.0)
	Middle	11(9.2)
	Matric (10th Grade)	22(18.3)
	Intermediate	16(13.3)
	Graduate	19(15.8)
Sources of Income	Livestock only	31(25.7)
	Livestock+ Crops	72(60.1)
	Livestock+ Other[1]	17(14.2)
Annual Income	<1 lac	33(32)
	1-2 lac	69(54)
	>2 lac	18(13)

Source:Field Data 2013 Note: Values given in parenthesis are percentages

Table 2: Number of Livestock heads kept by the respondents

Livestock			Number of Heads	%
Buffaloes	Calves		396	15.4
	Heifers		240	9.3
	Adult	Dry	150	5.8
		Lactating	833	32.3
Cattle	Calves		154	5.9
	Heifers		65	2.5
	Adult	Dry	54	2.1
		Lactating	189	7.3
Sheep	Lambs		30	1.2
	Adult stock		47	1.8
Goats	Kids		112	4.3
	Adult stock		298	11.6
Others	Donkeys		4	0.2
	Horses		7	0.3
	Camels		0	0
Total			2579	100

Source: Field Data 2013

Table 3: Livestock Population of Pakistan

Species	2010-11[1]	2011-12[1]	2012-13[1]
Cattle	35.6	36.9	38.3
Buffalo	31.7	32.7	33.7
Sheep	28.1	28.4	28.8
Goat	61.5	63.1	64.9
Camels	1.0	1.0	1.0
Horses	0.4	0.4	0.4
Asses	4.7	4.8	4.9
Mules	0.2	0.2	0.2

Source: Economic Survey of Pakistan, 2013

[1]Estimated Figure based on inter census growth rate of Livestock Census 1996 & 2006

Table 3:Purpose of livestock farming

Purpose	Frequency
To increase family income*	51 (42.2)
To fulfill food requirements*	37 (30.8)
To improve living standards*	29 (24.1)
To utilize free time*	3 (2.5)

* Multiple responses Note: *Values in the parenthesis are percentages*

development. Especially, in the present scenario when we are striving for the tight competition not on national level but also around the globe.

Capital holding leads toward development and prosperity. In this respect, in the study area financial condition of the people was seen below mark as most of them were subsistent. Livestock was the main occupation in the area and overwhelming majorities were observed to be dependent on livestock for their livelihood building. Data also depicts that majority (60.1%)of respondents were heavily dependent on livestock and crops farming for the income generation. One fourth (25.7%) respondents were depending only on livestock for the income generation which is the way toward their livelihood development. Slightly greater than half (54%) respondents were getting income between 1-2 lac from the livestock and crops farming while 32% were stagnant to up to 1lac income. Nominal number of respondents (13%) was getting income more than 2 lac and these guys were assumed as progressive farmers of the study area.

Livestock Population: Data depicted in Table 2 illustrate the sound population of livestock in the area. In study area total 2579 livestock animals were reported of varied kinds. In the totals aid population 62.8% were buffaloes of varied age. Among the buffaloes 32.3% were lactating representing the contribution of sold milk in income generation. Cattle population was 17.8% in total out which 5.9% were the calves, 2.5% were the heifers, 2.1% dry cows and 7.3% were the lactating cows. Here gain castles were also contributing in income generation through milk selling. The population of small ruminants such as goats and sheep was not phenomenal. Furthermore population of other animals such as donkeys and horses was negligible. Few of the respondents were keeping these animals just for the drafting purpose.

Overall look describes that the majority of the people were inclined toward buffaloes and cattle just because of more profit. Buffalo is assumed as more productive regarding milk while cattle is assumed as more productive regarding selling as calves. Pakistan is also famous for the productive breeds of Buffaloes also known as black gold of Pakistan.

Statistical data mentioned in Table 3 is all about the livestock population and illustrating the dominancy of cattle and buffaloes in entire country. It's also the fact that population varied from region to region and also the prices vary from zone to zone. It's also clear from the table that from the couple of years the population of livestock

[1]Other sources include; Teaching, lawyer, private job, retail shop

Table 4: Ranking of various needs of respondents fulfilled by livestock income

Needs	Mean	S.D
Food	4.53**	0.579
Child Education	4.25**	0.646
Other Needs[2]	3.87*	0.755
Health	3.35*	0.629
Living Standard	3.25*	0.651
Clothing	3.13*	0.559

*Important Needs **Most important Needs

animals is increasing. Small ruminants' population is greater at all because of maximum rearing in the dry land and mountainous regions.

Purpose of Livestock Farming and Needs Fulfillment: Almost half (42.2%) of respondents argued to increase family income as purpose of livestock farming followed by the response of 30.8% respondents quoting fulfillment of food requirement as purpose of livestock farming. During informal discussion it was found that several respondents were having livestock as side business to promote their lifestyle through better earning along with their jobs or profession elsewhere. Negligible number or respondents were found doing livestock farming just for the sake of free time utilization. Several respondents reported during informal conversation that several problem and issues we remain able to solve through livestock especially in case of finance constraints and the livestock is their cash deposit.

It was seen that all the needs were being fulfilled by the livestock generated income. All the needs got means values greater than 3.00. Food got highest mean value of 4.53 and was rated as most important followed by the child education attaining mean value 4.25. Education is the essential element for prosperity and development and it's the priority of each and every parent to educate their children without keeping any discrimination of rural or urban in mind. Meanwhile today education is much expensive which not affordable for everyone in Pakistan. In this regard, livestock supports these families to carry their children education on by paying their expenses. Moreover, in the promotion of education in entire Pakistan, the role of Government of Pakistan is also noteworthy. Other needs, health and living standard got mean values of greater than 3 so these were also assumed as important.

Analysis of Informal Discussion with Respondents: Informal discussion was held with the respondents for the conformation of data obtained and information was gathered in various aspects. First of all respondents were inquired by their mode of action to fullfill their needs from livestock. Responses indicated that livestock is cash deposit for them and they used to sell animals when they need capita in urgency. These farmers were carrying livestock as business through cyclic process. One of the respondents quoted that

"Whenever, I have excessive amount I used to purchase animal of any kind such as cattle, calve or goat etc. this strategy works for me every time as I have excessive animals to sell and to earn excessive amount"

It was also reported by the several respondents that we used to sell animals near the stage of giving birth to baby which gives us maximum benefit. Furthermore, animals are also sold for the meat purpose. Additional milk marketing remains continues most of the time which is more profitable earning. When respondents were inquired about the cost analysis of expenditures and benefits, it was found that majority was satisfied that they are getting benefits. Few of the respondents who owned small number of animal were feeling themselves marginal regarding benefits.

During data collection, it was seen that negligible number of respondents were using bio gas technology despite of strong population of animals. Animals dung was being deteriorated because of proper management. Bio-gas is one of the best renewable energy source and Pakistan is now a days in severe energy crisis. In the light of these facts farmers were inquired about the usage of animal dung for bio-gas technology which could save a lot for them. Bio-gas not only has potential to full fill energy demand but also can save fuel wood and fertilizer cost which is immense, in the form of slurry. Lesser awareness, lack of technical knowledge and implementation cost were the aggregate problems reported by the respondents regarding the bio-gas adaptation. It appears from the discussion that farmers are unaware of biogas potential so its need of hour to popularize their renewable energy source among farming communities. It will be better to utilize the animal dung instead of its wastage. Pakistan has tremendous potential of 1,104 "000" tons animal dung which can produce phenomenal quantity of bio-gas along with slurry [10].

[2]Other Needs include; Daughter's marriage, Sister's marriage, son's marriage, at funerals, to buy agricultural inputs

Table 5: Economic Benefits of Bio-Gas Plant

Comparison of Bio Gas	$25m^3$	$20m^3$	$15m^3$	$10m^3$	$8m^3$	$6m^3$	$4m^3$
Monthly saving of Wood	19 mounds	16 mounds	13 mounds	10 mounds	08 mounds	06 mounds	04 mounds
Monthly saving of Wood Prices	6650 RS	5600 RS	4550 RS	3500 RS	2800 RS	2100 RS	1400 RS
Monthly saving of Cylinder Prices	14000 RS	11000 RS	9000 RS	6500 RS	5000 RS	4000 RS	2500 RS
Plants Guarantee	4 years	4 years	4 years	4 years	4 years	4 years	4 years
Savings of Chemical Fertilizers	By using Bio-Slurry with chemical fertilizers for the crops can save almost 50% expenses.						

Source: RSPN (Rural Support Programe Networks)

Table 6: Benefits of Conversion of Diesel Tube wells in to Bio-Gas tube well

Plant Size	Diesel Fuel Savings
$25m^3$	65-75%
$20m^3$	65-70%

Source: RSPN (Rural Support Programe Networks)

Table 7: Constraints faced by the Livestock Growers

	Problems	Mean	SD
Finance	Lack of capital resources	4.44*	0.76
	Small herd size	4.41*	0.77
	Non availability of credit facilities	3.63*	1.00
	Poor information about Credit facilities	2.29	0.61
Feeding	Costly feed and fodder	3.92*	0.74
	Adulterated feed and fodder	1.96	0.20
	Non availability of feed and fodder	1.91	1.73
	Non availability of fresh water	1.58	0.54
Breeding	Non availability of technical assistance	2.52	0.95
	High cost of semen	2.02	1.53
	Non availability of semen	1.22	0.74
Management	Availability of land for housing the animals	0.98	0.75
	Availability of water for Washing/bathing of Animals	1.08	1.78
	Availability of Vaccination	2.73	1.32
	Control of parasites	3.04*	1.03
Extension Services	Inadequate livestock extension services	4.12*	0.45
	Poor information about modern livestock services	4.34*	0.66
	Lack of technical knowledge	3.20*	1.22
Marketing	Marketing uncertainty	4.66*	0.38
	Lack of proper markets	4.47*	0.78
	Low rate of livestock and livestock products	4.78*	0.57
	High broker's commission	4.16*	0.69

*Most important

The major income source identified were livestock and crops farming. In this respect if farmers are made aware about the benefits of Bio-gas then these farmers will automatically go for the bio-gas plants. The effective use of animal dung in the form of bio-gas will help farmers in running tube wells, for cooking purpose and extended production of crops through saving of chemical fertilizers. The saved capital will help in the improvement of their livelihoods.

Constrains Facing Farmers: Data mentioned in Table 7 is representing the constraints being faced by the livestock farmers. These constraints were of varied nature such as related to finance, feeding, breeding, management, services and marketing. Lack of capital resources and small herd size possessions appeared most important constraints relevant to finance problems. Insight look also explains that these limited resources possession also affects the adoption process regarding scientific dairy practices. In this perspective, reducing the feed prices would encourage the livestock breeding. In addition, several production practices can increase cow herd returns either by increasing revenue or by reducing costs. Regarding feeding problems high cost of feed and fodder showed dominance with mean value of 3.92.

Table 8: Correlation between different problems and number of livestock (cattle, buffaloes)

	Problems	Cattle	Buffaloes
Finance	Lack of capital resources	-0.253**	-0.422**
	Small herd size	-0.245**	-0.444**
	Non availability of credit facilities	-0.192*	-0.216*
	Poor information about Credit facilities	-0.389**	-0.329**
Feeding	Costly feed and fodder	-0.108	0.091
	Adulterated feed and fodder	-0.031	0.120
	Non availability of feed and fodder	-0.011	-0.051
	Non availability of fresh water	0.027	0.178
Breeding	Non availability of technical assistance	0.630**	0.160
	High cost of semen	0.662**	0.160
	Non availability of semen	0.661**	0.162
Management	Availability of land for housing the animals	-0.186*	-0.298**
	Availability of water for Washing/bathing of Animals	0.005	-0.178
	Availability of labour for milking the animals	-0.088	0.190*
	Availability of Vaccination	-0.111	-0.148
	Control of parasites	-0.178	-0.160
Extension Services	Poor extension services	-0.018	0.011
	Poor information about modern livestock	-0.021	0.060
	Lack of technical knowledge	-0.004	0.101
	Less EFS field visits	-0.153	-0.085
Marketing	Marketing uncertainty	-0.072	0.179
	Lack of proper markets	0.068	0.284**
	Low rate of livestock and livestock products	-0.035	0.118
	High broker's commission	0.007	0.104

** = Significant (P<0.05); ** = Highly significant (P<0.01)*

In Pakistan the productivity of livestock is lower than the potential which is also the cause of lower income generation for farmers.

Disease outbreaks are always assumed as dangerous and productivity loosening agents. Meanwhile, control of parasite which cause diseases were rated as important constraint possessing mean value of 3.04. Extension sector always works as a bridge between research and farmers. Especially in the case when quick dissemination is purpose or sudden improvement is needed extension plays role very well. Unfortunately, in the study area role of livestock extension was not so good, resultantly; extension services originated severe and most important constraints. These constraints also exhibit the need of rehabilitation of livestock extension sector. Furthermore, marketing appeared another most important constraint along with inadequate extension services. Farmers do livestock farming for better return but uncertain and fluctuating rates deprive farmers' expectations.

Cattle and buffaloes among livestock are assumed as most preferable because of their extended benefits. It's also assumed that several hindering factors exist which affects the productivity and potential as well. In this perspective correlation analysis was carried out to examine the association between number of animals (cattle and buffaloes) and factors hindering the potential. Analysis indicated highly significant relationship between financial constraints and population of cattle and buffaloes as well. Feeding problems didn't show any significant relationship but showed relation in negative and positive way. Breeding problems showed highly significant association with cattle population kept but simple positive relationship in case of buffaloes. Within managements problems; Availability of land for housing the animals was significantly correlated with number of livestock in case of cattle while in case of buffaloes association was highly significant. Availability of labour for milking the animals was significantly correlated with number of animals. It describes that as the number of lactating animals increase, the demand of the labour will increase for proper management. Extension services also didn't show any significant association but the association varied from negative to positive revealing the strengths and weakness of extension services. Marketing problems are most immense in Pakistan as most of the times farmers remain unable to get their desired rates. In this regard, marketing was highly correlated with buffaloes population.

CONCLUSION

Present study concludes that farmers were having enough resources especially in the form of livestock to generate income. Moreover, income generation was also playing enough roles in their development. Various purposes and needs of daily life were being fulfilled by the farmers from livestock. However, potential of livestock as renewable energy source was still unknown to farmers. This potential as renewable energy source, if utilized can help a lot the farmers in the form of saving of fuel wood expenses, energy purpose and as fertilizers for the crops. Still farmers were getting lower potential because of the dominance of some constraints such as limited resources, small population of livestock and costly feed. Moreover, livestock extension services appeared as most dominant problems along with the severe issue of marketing unavailability. Findings suggest that there is dire need to diversify the role of extension field staff in entire country for the extended development of farming communities. Moreover, subsidy programs along with micro credits schemes should be started by government of well being of farmers. There is dire need of associated work of public and private sector and NGO's for the familiarity and implementation of biogas to popularize it as renewable energy source. This will not only help farmers in thir development but also will help country to cover up the energy crisies. International organization and organizations working for the development should be invited to invest here in rural remote areas of Pakistan where potential exist but needs to be shine.

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