Management of Different Dairy Production Systems in Sindh

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Abstract: The study of management of different dairy production system in Sindh was conducted in randomly selected from three zones consisting of nine districts of Sindh province of Pakistan. The data was collected from central zone consisting of three districts (Hyderabad, Mirpurkhas and Shaheed Benazirabad) in 2005-06, from upper zone (districts i.e. Larkana, Sukkur and Shikarpur) in 2006-07, and from lower Sindh zone(Karachi, Thatta and Badin) in years 2007-08. The educational status indicated that the graduate dairy farmers were significantly (P<0.05) high (21.11%) at urban dairy farming systems compared to peri-urban, rural market oriented, rural subsistence and mixed dairy farming systems. The results shows that urban and peri urban farming mostly was operated by ≥ 40 years of age group but under, rural market oriented , rural subsistence and mixed dairy farming ≥50 years of age group. The average herd size of urban dairy farming system was (52.67 animals per farm) higher as compare to peri-urban, rural market oriented, mixed and rural subsistence dairy farming system in upper zone. In central zone the results showed that the average herd size of peri-urban dairy farming system was significantly (100.00/farm) higher followed by other farming systems. The average herd size under urban dairy farming system in lower zone observed significantly (P<0.05) high (167.00/farm) as compared to other dairy farming systems. The overall average annual inventories at the beginning of the year urban, peri-urban, rural market oriented, rural subsistence and mixed farming were 129049, 82920, 74634, 35300 and 46658 rupees, respectively and averaging 73712 rupees. The total cost were relatively higher Rs.64506 per animal under urban farming, and the lowest total costs of Rs.31884 per animal were noted under mixed farming system. The total income generated by operators of urban dairy farms in nine districts were recorded high followed by peri-urban, rural market oriented, rural subsistence and mixed dairy farming system. It was observed that from the results that the cost: benefit ratio was significantly higher 1:0.47 under mixed farming system, followed by rural market oriented farming with average cost benefit ratio of 1:0.44. However, the cost benefit ratio under peri-urban, urban, rural subsistence dairy farming systems was 1:0.42, 1:0.36 and 1: 0.34 respectively. The results indicated that the capital turnover was higher 5.66 in case of urban farming indicating that the entrepreneur of urban dairy farming system will recoup their capital investment in 5.66 years, while the capital turnover of peri urban, rural subsistence, rural market oriented and mixed dairy farming systems was 4.33, 4.25, 3.82 and 3.72 indicates that they will recoup their capital investment in 4.33, 4.25 and 3.82 years, respectively. However, the entrepreneurs of mixed farming system will recoup their capital investment in 3.72 years, respectively.

Keyword: Dairy, production, farming, literacy, economic efficiencies, zones, Sindh.

INTRODUCTION

The livestock sector play important role in agriculture contributing of 58.55 with growth of 3.63 during 2015-2016 compared to 3.99 percent growth during the same period last year [1]. The livestock sector is an important sub-sector of agriculture and plays a key role in the economy of Pakistan. It contributed 55.9% to agriculture value added, 11.5% to the country's GDP and 13% to the total export during 2013-14.The milk production increased by 3.2 percent and meat 4.5 percent during 2013-14 as compared to corresponding period last year. Yet, agricultural development in Pakistan, especially the development of the livestock sub-sector, is lagging behind in the national demand for respective demand. Gross value addition of livestock at current factor cost has increased from Rs.735 to Rs.756 billion showing an increase of 2.9 percent as compared to previous year [2]. Demand for food in general, and for livestock products in particular, will continue to rise in and around cities with increasing urbanization [3]. The growing demand of urban dwellers for milk has been a major driving force for the establishment of urban and peri-urban dairy farms in cities such as Karachi, Lahore, Faisalabad and Islamabad [4,5,6], whereby the number of such farms in Pakistan has tripled from 1986 to 1996 [5]. Rather than lack of access to product markets, the principal constraints to urban and peri-urban livestock rearing in developing countries are of technical nature and policy-related [7].

The population growth, increase in per capita income and export revenue is fueling the demand of livestock and livestock products. In order to speed up the pace of development in livestock sector, the Ministry of Livestock and Dairy Development was created as a part of reform agenda and commitment of the government to improve service delivery, reduce poverty, achieve sustainable economic growth and expand opportunities to address the needs of rural livestock farmers and to protect the livelihood concerns

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of rural community [8]. Pakistan with current estimates is the 4th largest milk producing country in the world with 33 billion liters of milk produced annually. The potential is huge but the sector operates mostly in the informal economy and needs a consistent effort to formalize and be able to contribute better to the national economy. Out of the total milk produced, 97% is in the informal sector (i.e. raw milk consumed in the villages and or sold in the cities through "Gawallas" (milk venders) in unhygienic conditions and without any quality standards [9]. There are 8 million farming households in Pakistan with a total herd size of 50 million animals, 97% of these farmers are not linked to formal markets and hence are not progressing in economic terms. Moreover, the overall animal herd of Pakistan is thinly spread across thousands of square kilometers with an average of 2 to 5 animals per household. Dairy farming practices are very old and traditional and need overhauling [10]. Various types and systems of dairy farming are in operation. The livestock farming and production systems adopted in our country for dairying offer ample job opportunities and promising returns for urban and rural population. Chunk of milk, like most of the other agricultural commodities is produced in areas far away from the urban consumption centers. The reason of preparation of these by products is due to unavailability of proper marketing facilities in rural areas [11]. The expansion of dairy farming besides increasing milk, beef supply will also help in creating jobs particularly in rural areas, where agriculture labor is already saturated. In most cases, urban dairies also engage labor, coming from adjoining rural areas. The potential is there but needs technical support from the industry, strategic support from dairy experts, policy and infrastructure from the government and specific projects funding from the international donor agencies. The potential is estimated on the basis of the fact that livestock and agriculture sector contributes over 10% to the GDP, and a milk economy that in value terms is 27.7% of the total agriculture sector. It is an untapped market, expected to grow an additional 3 billion liters in the next few years at a growth rate faster than most sectors, and 30% by 2015 [10]. A study is therefore carried out to management of different dairy production systems in Sindh province.

MATERIALS AND METHODS

Study Area

Present investigation was conducted on dairy production systems during the years 2005 to 2007.In this regard the study area was scattered over Sindh province of Pakistan. Although, it was difficult to cover each and every corner of the province in relation to documentation of the dairy production systems, yet a systematic representation was planned though covered natural ecological zones of Sindh province viz: upper, central and lower zones. Moreover, from each zone three districts were randomly selected for further investigation.

Identification of Dairy Production Systems

A comprehensive survey was carried out to identify the different dairy production systems operating at Sindh province, and conclusively, five dairy production systems viz: Urban, Peri-urban, Rural market oriented, Rural subsistence and Mixed dairy production systems were noted, though varied in their managements characteristics from one another (Figure **1**).

Sampling Strategy/Data Collection

A snowball sampling procedure was applied to select and interviewed the respondents of different dairy production systems at Sindh province. A total of 1530 dairy farmers at Sindh province, 510 respondents

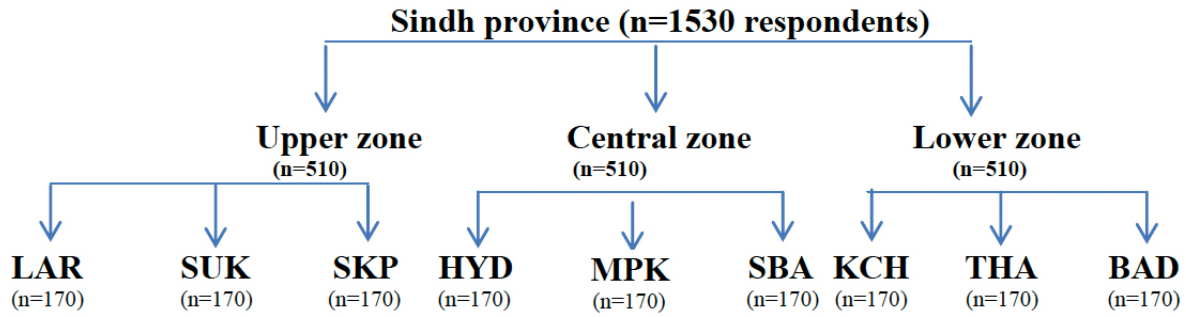

Figure 1: Flow chart showing sampling strategy at Sindh Province.

LAR= Larkana, SUK= Sukkur, SKP= Shikarpur, HYD= Hyderabad, MPK= Mirpurkhas, SBA= Shaheed Benazirabad, KCH= Karachi, THA= Thatta, BDN= Badin.

in each zone and / or 170 respondents in each districts of each zone were interviewed face to face using a pretested structure questionnaire.

Economic Efficiency

In order to judge the economic efficiency of the dairy farms the following parameters were calculated: Net return, Input-output ratio, Cost: Benefit ratio.

Statistical Analysis

Data were gathered, tabulated and analyzed through computerized statistical package of student edition of statistics (SXW), Version 8.1(Copy right 2005, Analytical Software, USA).

Procedure of analysis of variance (ANOVA) was applied to observe the significant difference between variables, and in case of variation occurred, the data were further proceed for least significant difference (LSD) test at 5 % level to note the difference between the means of different variables.

RESULTS

Educational Level of Dairy Farmers

The data (Table **1**) showed that at highest study level i.e. graduate was recorded at urban dairy farming system (16.67%), (30.00%) and (16.67%) in all three zones while minimum level of study i.e. primary was recorded at rural market oriented dairy farming system

Table 1: Educational Levels of Dairy Farmers at Different Dairy Farming Systems Identified at Three Zones of Sindh Province

Dairy farming zones (n=510 in each zone)	Dairy farming system(n=102 in each system)	Educational level of dairy farmers (%)						
		Graduate	Intermediate	Matric	Middle	Primary	Total literate	Total Illiterate
Upper	U	16.67^{b}	20.00 ^{a}	26.67 ^{ab}	16.67 $^{a-c}$	13.33 ^{bc}	93.34	6.66 ^{e}
	PU	10.00 $^{b-d}$	16.67 ^{ab}	20.00 $^{a-d}$	20.00 $^{a-c}$	23.33 ^{ab}	90.00	10.00 ^{de}
	RMO	10.00 $^{b-d}$	20.00 ^{a}	30.00 ^{a}	13.33 ^{bc}	10.00 ^{c}	83.33	16.67 ^{ce}
	RS	-	3.33 ^{ab}	16.67 $^{b-e}$	16.67 $^{a-c}$	26.67^{a}	63.34	36.67 $^{a-c}$
	MXD	3.33 ^{cd}	3.33 ^{ab}	6.67 ^{ef}	13.33 ^{bc}	16.67 $^{a-c}$	43.33	56.67 ^{a}
Central	U	30.00 ^{a}	20.00 ^{a}	20.00 $^{a-d}$	13.33 ^{bc}	10.00 ^{c}	93.33	6.67 ^{e}
	PU	13.33 ^{bc}	20.00 ^{a}	23.33^{a-c}	16.67 $^{a-c}$	20.00 $^{a-c}$	93.33	6.67 ^{e}
	RMO	6.67^{b-d}	20.00 ^{a}	23.33 $^{a-c}$	23.33 ^{ab}	16.67 $^{a-c}$	90.00	10.00 ^{de}
	RS	6.67^{b-d}	13.33 ^{ab}	13.33 $^{c-f}$	20.00 $^{a-c}$	26.67^{a}	80.00	20.00 $^{c-e}$
	MXD	-	-	16.67 $^{b-e}$	13.33 ^{bc}	13.33 ^{bc}	43.33	56.67 ^{a}
Lower	U	16.67^{b}	16.67 ^{ab}	13.33 $^{c-f}$	16.67 $^{a-c}$	13.33 ^{bc}	76.67	23.33 $^{c-e}$
	PU	6.67^{b-d}	16.67 ^{ab}	13.33 $^{c-f}$	20.00 $^{a-c}$	23.33 ^{ab}	80.00	20.00 ^{ce}
	RMO	6.67^{b-d}	13.33 ^{ab}	20.00 $^{a-d}$	26.67 ^{a}	20.00 $^{a-c}$	86.67	13.33 ^{de}
	RS	6.67^{b-d}	13.33 ^{ab}	3.33 ^{f}	20.00 $^{a-c}$	26.67^{a}	70.00	30.00 $^{b-d}$
	MXD	6.67^{b-d}	10.00 ^{ab}	10.00 $^{d-f}$	10.00 ^{c}	13.33 ^{bc}	50.00	50.00^{ab}
LSD 0.05		13.15	17.4	10.84	10.84	12.68	-	20.65
SE±		6.44	8.34	5.30	5.31	6.21	-	10.11

Values with different superscripts with in column are significantly different from one another.
U = Urban, PU = Peri-urban, RMO = Rural Market Oriented, RS = Rural subsistence, and MXD= Mixed.

Table 2: Age Level of Dairy Farmers at Different Dairy Farming Systems at Different Zones of Sindh Province

Zones (n=510 in each zone)	Dairy farming Systems	Levels of age (%) Years			
		<30	≥ 30	≥40	≥50
Upper	U	6.67^{k}	23.33^{g-i}	30.00^{e-h}	40.00^{b-e}
	PU	10.00^{jk}	26.67^{f-h}	36.66^{c-f}	26.67^{f-h}
	RMO	10.00^{jk}	20.00^{h-j}	36.67^{c-f}	33.33^{d-g}
	RS	10.00^{jk}	20.00^{h-j}	26.67^{f-h}	43.33^{a-d}
	MXD	10.00^{jk}	13.33^{i-k}	26.67^{g-i}	50.00^{ab}
Central	U	6.67^{k}	26.67^{f-h}	46.66^{a-c}	20.00^{h-j}
	PU	6.67^{k}	20.00^{h-j}	40.00^{b-e}	33.33^{d-g}
	RMO	6.67^{k}	26.67^{f-h}	23.33^{g-i}	43.33^{a-d}
	RS	13.33^{i-k}	20.00^{h-j}	26.67^{f-h}	40.00^{b-e}
	MXD	10.00^{jk}	10.00^{jk}	26.67^{f-h}	53.33^{a}
Lower	Urban	10.00^{jk}	23.33^{g-i}	26.67^{f-h}	40.00^{b-e}
	PU	3.33^{k}	26.67^{f-h}	40.00^{b-e}	30.00^{e-h}
	RMO	6.67^{k}	23.33^{g-i}	30.00^{e-h}	40.00^{b-e}
	RS	10.00^{jk}	13.33i-k	30.00^{e-h}	46.67^{a-c}
	MXD	13.33^{i-k}	20.00^{h-j}	23.33^{g-i}	43.33^{a-d}
LSD			11.84		
S.E±			5.98		

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U = Urban, PU = Peri -urban, RMO = Rural Market Oriented, RS = Rural subsistence and MXD= Mixed.

in upper zone and urban dairy farming system in central zone of each (10%) and (13.33%) at urban dairy farming system in lower zone.

Age Level of Dairy Farmers

The results of the survey in relation to age of respondents (Table **2**) showed that 6.67-13.33% of the dairy farmers in the study area were in the age group of <30 years, 10.00 – 26.67% were in the age range of ≥ 30 years, 23.33 – 46.66% of the respondents were in the age group of ≥40 while 20.00 – 53. 33% dairy farmers were in the age group of ≥50 in all three zones.

Herd Size under Different Dairy Farming Systems

The results (Table **3**) revealed that the average herd size of urban dairy farming system was (52.67 animals per farm) higher followed by peri-urban, rural market oriented, mixed and rural subsistence dairy farming system in upper zone. In central zone the results showed that the herd size of peri-urban dairy farming system was significantly (100.00/farm) high compared to other dairy farming systems. Moreover, the average herd size under urban dairy farming system in lower zone observed significantly ($P<0.05$) high (167.00/farm) than that of peri-urban, rural market oriented, mixed and rural subsistence dairy farming systems.

Stock Inventories under Different Dairy Farming Systems

The results (Table **3**) indicated that an average value of stock inventories at urban was Rs.128054 as compare to peri-urban Rs.85538, rural market oriented Rs. 70208, mixed Rs.43512 and rural subsistence Rs.31472 at the beginning of the year. However, an average value of stock inventories at the end of the year of urban dairy farming system was found Rs.130438 followed by peri-urban Rs.85503, rural market oriented Rs. 71220, mixed Rs.43738 and rural subsistence Rs.30758. In upper zone, data shows an average value of stock inventories running under urban dairy farming system was recorded Rs.129246 followed by peri-urban Rs.87021, rural market oriented Rs. 70714, mixed Rs.43625 and rural subsistence Rs.31115. The data further revealed that an average value of stock inventories running under urban was Rs.98166 as compare to peri-urban Rs.68930, rural market oriented Rs. 62056, mixed Rs.40548 and rural subsistence Rs.35447 in central zone. Observations an

Table 3: Average Herd Size and Average Values of the Stock Inventory under Different Dairy Farming Systems in Selected Districts of Different Zones in Sindh

Zones n=510 in each zone	Systems n=102 in each system	Herd size (Avg)	Values of the stock inventory (Avg)		
			At the beginning of the year	At the end of the year	Average value of the stock Inventory
Upper	U	52.67 $^{a-c}$	128054^{b}	130438^{b}	129246^{a}
	PU	50.67^{b-c}	85538^{cd}	88503^{cd}	87021^{a-e}
	RMO	17.67^{c}	70208de	71220de	70714^{b-f}
	RS	3.33^{c}	31472^{h}	30758^{g}	31115^{f}
	MXD	8.33^{c}	43512^{fh}	43738^{fg}	43625^{ef}
Centeral	U	93.67^{a-c}	98166^{c}	101461^{c}	99813^{a-c}
	PU	100.00^{a-c}	68930de	71753de	48090^{d-f}
	RMO	92.67^{a-c}	62056^{ef}	65164^{d-f}	63610^{b-f}
	RS	3.33^{c}	35447^{gh}	32783^{g}	34115^{f}
	MXD	8.67^{c}	40548^{gh}	40754^{fg}	40651^{ef}
Lower	U	167.00 ^{ab}	160928^{a}	172040^{a}	103205^{ab}
	PU	189.33^{a}	94291^{c}	97694^{c}	95992^{a-c}
	RMO	117.00^{a-c}	91637^{c}	98226^{c}	94931^{a-d}
	RS	4.00^{c}	38982^{gh}	35322^{g}	37152^{f}
	MXD	7.00^{c}	55914^{e-g}	54293^{e-g}	55103^{c-f}
LSD		136.76	21166	24811	46995
S.E±		66.76	10333	12112	22942

Values with different superscripts with in column and rows are significantly different from one another.
U = Urban, PU = Peri-urban, RMO = Rural Market Oriented, RS = Rural subsistence, and MXD= Mixed.

average value of stock inventories at the end of the year of urban dairy farming system was recorded Rs.101461 followed by peri-urban Rs.71553, rural market oriented Rs. 65164, mixed Rs.40754 and rural subsistence Rs.32783 (Table **3**) in central zone. The results revealed that an average value of stock inventories under urban dairy farming system was recorded Rs.99813 followed by peri-urban Rs.48090, rural market oriented Rs. 63610, mixed Rs.40651 and rural subsistence Rs.34115 in central zone.

In lower zone the data revealed that an average value of stock inventories at the beginning of the year running under urban dairy farming system was Rs.160928 as compare to peri-urban Rs.94291, rural market oriented Rs. 91637, mixed Rs.53914 and rural subsistence Rs.38982. Stock inventories of an average values at the end of the year of urban dairy farming system was observed Rs.172040 followed by rural market oriented Rs. 98226, peri-urban Rs.97694, mixed Rs.54293 and rural subsistence Rs.35322 (Table **3**). An average value of stock inventories running under urban dairy farming system was observed Rs.103205 followed by peri-urban Rs.95992, rural market oriented Rs. 94931, mixed Rs.5513 and rural subsistence Rs.37152.

Table 4: Vaccination Schedule Practiced under Different Dairy Farming Systems in Sindh

S. No.	Name of disease	Time vaccination
1.	Anthrax	August
2.	Black quarter	March
3.	Heamorrhagic septicemia	June-July
4.	Heamorrhagic septicemia	October - December
5.	Foot and mouth disease	January-April
6	Rinderpest	August-September

Watering

The animals were watered twice in 24hours in summer and once in winter. At every dairy farm irrespective to consider its zone or system there was

regular arrangement of water and they had installed electric water pumps.

Breeding

Breeding in all dairy farming systems except in rural subsistence and mixed, bull for breeding was available and natural breeding was practicing. However, artificial insemination was also found in practice, particularly at urban, peri urban and rural market oriented dairy farming systems.

Health Care

The dairy farmers in the upper, central, and lower zone were found to be well aware of general disease outbreaks and other disorders occurred in dairy animals. Vaccination schedule was in practice with the dairy farmers in upper, central, and lower zone (Table **4**).

Economic Analysis

While in lower zone, with in five districts, the total cost of urban dairy farming system was Rs.81308 recorded significantly higher than peri-urban, rural market oriented, rural subsistence and mixed (Table **5**).

Total Cost and Income under Different Dairy Farming Systems

The results (Table **5**) showed that the comparison of districts indicates that total cost was significantly higher in urban dairy farming system Rs. 61377 per animal as compared to peri-urban, rural market oriented, rural subsistence and mixed dairy farming system in upper zone. However, the statistical analysis shows that there were highly significant ($P<0.05$) difference was recorded between urban and mixed dairy farming system. In central zone, the total cost in urban dairy farming system was observed significantly higher (Rs.50833) than other farming systems. While in lower zone, with in five districts, the total cost of urban dairy farming system was Rs.81308 recorded significantly higher than peri-urban, rural market oriented, rural subsistence and mixed.

The total income (Table **5**) generated by operators with in five systems, urban dairy farming systems dairy farmers produced Rs.83945 and Rs.110913 per animal in upper and lower zones respectively, while peri-urban dairy farmers from central zone earned significantly high income Rs.69678 per animal than other dairy farming system in all three zones. The results further

Table 5: Average Total Cost and Average Total Income under Different Dairy Farming Systems of Different Zones in Sindh

Zone n=510 in each system	Systems n=102 in each	Total cost	income
Upper	U	61377^{b}	83945^{b}
	PU	58198^{bc}	82430^{b}
	RMO	55021^{b-d}	77368^{b}
	RS	35117^{f}	44068^{de}
	MXD	31694^{f}	44458^{de}
Central	U	50833^{cd}	69067^{bc}
	PU	48881^{cd}	69678^{bc}
	RMO	45615^{de}	67056^{bc}
	RS	30312^{f}	38048^{e}
	MXD	30460^{f}	42833^{de}
Lower	U	81308^{a}	110913^{a}
	PU	76336^{a}	108248^{a}
	RMO	73477^{a}	107162^{a}
	RS	38700^{ef}	58621^{cd}
	MXD	33499^{f}	37271^{e}
LSD		9462.4	18281
SE±		4619.4	8924.6

Values with different superscripts with in column are significantly different from one another.
U = Urban, PU = Peri -urban, RMO = Rural Market Oriented, RS = Rural subsistence, and MXD= Mixed.

indicated that the statistical differences between urban, peri-urban and rural market oriented dairy farming systems were found similar (P<0.05) to each other in central zone.

Net Returns under Different Dairy Farming System

The dairy farms under peri-urban dairy farming system generated relatively higher profits of Rs. 24232 per animal per annum as compared to urban, rural market oriented, mixed and rural subsistence per animal in upper zone (Table **6**). The net returns of central and lower zones dairy farms under rural market oriented dairy farming system produced comparatively higher profits of Rs. 21441 and Rs. 33686 per animal per annum respectively than other dairy farming systems. The result further showed that the statistical variation between rural market oriented and peri-urban, urban and mixed dairy farming systems were found similar (P<0.05) to each other in central zone.

Cost Benefit Ratio under Different Dairy Farming System

On one rupee investment, the net income received is termed as the cost: benefit ratio, and after such adjustments, the results are reported in Table **6**. The cost benefit ratio was relatively higher in peri-urban 0.4167 followed by rural market oriented, mixed, urban and rural subsistence in upper zone. However, in central zone, the cost benefit ratio was comparatively higher in rural market oriented 0.4701 as compared to other farming systems. The result indicated that the cost benefit ratio was expressively higher in mixed dairy farming system 0.6208 than that of rural subsistence, rural market oriented, peri-urban and urban in lower zone. The statistical data shows that differences between urban and mixed dairy farming systems were found significantly (P<0.05) high to each other.

Capital Turn-Over under Different Dairy Farming System

The capital turnover was calculated on the basis of capital cost and the profit. The outcome of this calculation is reported in Table **6**. It was observed that the mean capital turnover was higher and will recoup their capital investment in 5.77, 5.51 and 5.70 years in urban dairy farming systems in upper, central and lower zones respectively.

Table 6: Net Returns, Cost Benefit Ratio and Capital Turn Over under Different Dairy Farming Systems of Different Zones in Sindh

Zones	Systems	Net return	Cost benefit ratio	Capital turn over
Upper	U	22568^{b-e}	0.3677^{d}	5.7733^{a}
	PU	24232^{a-d}	0.4167^{cd}	4.5567^{bc}
	RMO	15156^{d-f}	0.4063^{cd}	3.7767^{de}
	RS	8951^{g}	0.2549^{e}	3.72607^{de}
	Mixed	12764^{e-g}	0.4027^{cd}	3.4600^{e}
Central	U	12319^{fg}	0.3587^{d}	5.5133^{a}
	PU	20797^{c-f}	0.4256^{cd}	4.2633^{b-d}
	RMO	21441^{c-f}	0.4701^{bc}	3.7067^{de}
	RS	7736^{g}	0.2553^{e}	4.7433^{b}
	Mixed	12373^{fg}	0.4062^{cd}	3.5033^{e}
Lower	U	29606^{a-c}	0.3637^{d}	5.7067^{a}
	PU	31912^{ab}	0.4199^{cd}	4.1800^{b-d}
	RMO	33686^{a}	0.4610^{bc}	3.9633^{c-e}
	RS	14197^{d-g}	0.5123^{b}	4.2733^{b-d}
	Mixed	20847^{c-f}	0.6208^{a}	4.2067^{b-d}
LSD		10150	0.0707	0.6429
SE±		4955.2	0.0245	0.3138

Values with different superscripts with in column are significantly different from one another.
U = Urban, PU = Peri -urban, RMO = Rural Market Oriented, RS = Rural subsistence, and MXD= Mixed.

The statistical analysis shows that variation between peri-urban, rural subsistence and mixed dairy farming systems were found similar (P<0.05) to each other in lower zone.

DISCUSSION

The present study showed that percent of dairy farmers with qualification of matric (20.00%), intermediates (13.33%) and graduates were (6.67%) at rural market oriented dairy farming systems at lower zone. The results of present study were in close agreement with findings of Faheem *et al.* (2015) who studied the management patterns of dairy farms around Karachi and reported that 45.09% were educated up to matric level, 17.67% could complete college level studies (intermediates), while 7.84% of them were graduates. The present study further indicated that the dairy farmers with age of ≥ 30 years at peri-urban farms 26.67 % , ≥ 40 40.00% and with age level ≥ 50 years age were 30.00% in lower zone . Present study was supported by Faheem *et al.* (2015) who reported that 35.29% of the dairy farmers in the study area were in the age group of 30-40 years, 31.37 % were in the age group of 40-50 years, while 33.33% of the respondents were above 50 years of age. The present study revealed that the average herd size of urban dairy farming system was recorded (52.67, 100 and 167 animals per farm), peri-urban dairy farming system (50.67, 100, 189.33 per farm), rural market oriented (17.67, 92.67, 117per farm), rural subsistence (3.33, 3.33, 4.00 per farm) and mixed dairy farming system (8.33, 8.67 and 7 per farm) in upper, central and lower zones respectively. Present study was supported by [12] who studied 30 peri-urban dairy farms of Quetta and observed that the dairy farms of three categories referred as Small farms (1-40 animals), medium farms (41-80) and large farms (81-120), located in the radius of 20 kilometers from main city market. An average number of milking buffaloes kept on small farms was 9, medium farms 24 and on large farms 38. Fahim *et al.* [13] studied the influence of animal's contribution towards the total herd size was categorized as small, medium and large size according to the number of animals, i.e. farms possessing up to 40 animals were known as small farms, dairy farms with animal's 40-80animals were designated as medium size farms and farms having animal strength more than 80 animals were categorized as large size farms. In present study the comparison of districts indicates that total cost was significantly higher in urban dairy farming system Rs. 61377, Rs.50833, Rs.81308 per animal in upper, central and lower zone respectively compared to other farming systems. While, Bugti (2008) reported that total cost was Rs.324522 per farm per year. Furthermore, present study was supported by Memon (2008) who reported that the gross expenditure were Rs.36240, Rs.501264 and Rs.40393 per farm per annum.

The present study revealed that the income from milk generated by operators of urban dairy farms was (Rs. 83394) significantly higher than that of rural market oriented, peri-urban, mixed Rs. and rural subsistence in upper zone. The results of present study were in close agreement with findings of Khan [14] who reported that the gross income obtained from milk was Rs.10316.6793 per farm per year. While, Markhand [15] analyzed production and marketing of milk who reported that the gross income per animal per year was Rs.52418.09.

The dairy farms under peri-urban dairy farming system generated relatively higher profits of Rs. 24232 per animal per annum as compared to urban, rural market oriented, mixed and rural subsistence in upper zone. Present study was supported by Demircan *et.al* [19] who reported that production cost decreased and profit increased as animal unit per farm increased. Whereas, Syed [12] assessed the production patterns and marketing of milk and reported that the net income obtained by average farmer per farm was Rs.3307200 against the gross expenditure Rs.1905388 per farm per year and net returns Rs.149781per farm per year.

In present study the capital turnover was higher and will recoup their capital investment in 5.77, 5.51 and 5.70 years in urban dairy farming systems in upper, central and lower zones respectively. These results are fully supported by Fahim *et al.* [13] also reported similar results from his studies in Karachi, who indicated that the rates of capital turn over at small, medium and large size dairy farms existed in urban areas around Karachi city were 5.72, 4.60 and 3.73 which suggested that the entrepreneurs of small, medium and large dairy farms would be able to recoup their capital investment within 5.72, 4.60 and 3.73 years, respectively. The figures showed that large size farm operators will recoup their capital well earlier than the medium and small size dairy farm operators. Similarly Lohana [16] indicates that the dairy farmers in peri urban areas will received the capital investment back within 3.83 years at small farms, 6.91 years at medium size farms and 7.84 years at large size farms.

CONCLUSIONS

Majority of highly educated and at age of ≥50 dairy farmers were present in central zone. It was also observed that the net return was highest at rural market oriented in lower zone (Rs.33686) and mixed dairy farming system in upper zone will recoup their capital well earlier than the different dairy farming systems in other zones.

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