

MILK PRODUCTION POTENTIAL IN KHYBER PAKHTUNKHWA

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ABSTRACT:- This study was conducted in three agro-ecological regions, namely, *barani* areas, wet mountains and Northern dry mountains of Khyber Pakhtunkhwa, Pakistan by using concept of typical farms. The yield and production of milk gap was estimated in three scenarios. The results showed that the present milk production of Khyber Pakhtunkhwa is 2.74 mt with 1579 lit of milk per buffalo per year, 663 lit of milk per cow per year, 95 lit milk per goat per year and 64 lit of milk per sheep per year. The data in comparison to the National and World average, is far below from probable production levels. Except in buffaloes and goats where the farm level production of milk is higher than the World and sheep where the farm level production of milk of Khyber Pakhtunkhwa is higher than Pakistan and World. Overall the milk production of Khyber Pakhtunkhwa can be increased upto 5.82mt by proper management and genetic improvement. More research is needed at farm level in the context of breed adaptability and management in respect of cost of livestock herds production in Khyber Pakhtunkhwa, Pakistan.

Key Words: Milk Yield; Production Gap; Typical Farms; Pakistan.

INTRODUCTION

Livestock has been the subsistence sector dominated by small holders to meet the needs of milk, food security and daily cash income. It is central to the livelihood of the rural poor and can play an important role in poverty alleviation in Pakistan. Livestock the largest contributor to Pakistan's agriculture (55.4%) added 11.9 % to the national GDP during 2012-13 (GoP, 2013). According to the estimates made by FAOSTAT (2011) Pakistan is the 4th largest milk producing country in the world with 35.49 billion liters of milk, averaging 4.9% of the total world milk production. More than eight million farming households in Pakistan were involved

in livestock farming. The herds spread over thousands of square kilometers with an average of 2 - 5 animals per household (Pakistan Dairy Development Company, 2006). The milk sector in Pakistan economy can be used as a vehicle for rural development (Sarwar et al., 2002), as milk sector with a huge potential is mainly based in the rural sector of Pakistan (Hassan, 2011).

Khyber Pakhtunkhwa, has 5.97 million cattle, 1.93 million buffaloes, 3.36 million sheep and 9.6 million goats, having 1.87 million cattle and 0.81 million buffaloes in milk (Table 1). Simi-larly 0.6 million sheep and 5.5 million goats were female with above one year of age. Of the total 1.93 million milch cows, reported by

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Table 1. Livestock in Khyber Pakhtunkhwa (million)

Livestock	2006			2009-10		
	Pakistan	KPK	% share of KPK	Pakistan	KPK	% share of KPK
Cattle	29.56	5.97	20.20	34.30	7.60	22.16
Buffalo	27.33	1.93	7.06	30.80	2.30	7.47
Sheep	26.49	3.36	12.68	27.80	4.00	14.39
Goat	53.79	9.60	17.85	59.90	12.90	21.54
Total	137.17	20.86	15.21	152.80	26.80	17.50

Source: Khyber Pakhtunkhwa Development Statistics, 2010

Table 2. Number of animals in three districts of Khyber Pakhtunkhwa

Livestock	Study area	Total	Small herds	Medium herds	Large herds
Cattle	KPK	5967886	3180994 (53)	1714685 (29)	1072209 (18)
	D.I.Khan	411432	153696 (37)	205012 (50)	52725 (13)
	Mansehra	181973	130873 (72)	49319 (27)	1781 (01)
	Swat	253790	157744 (62)	85482 (34)	10563 (04)
Buffalo	KPK	1927495	1381306 (72)	369104 (19)	177079 (09)
	D.I.Khan	205634	78631 (38)	72509 (35)	54493 (26)
	Mansehra	191064	168422 (88)	22149 (12)	493 (0.3)
	Swat	117101	82982 (71)	30043 (26)	4075 (03)
Sheep	KPK	3363249	1894937 (56)	754273 (22)	714041 (21)
	D.I.Khan	248491	173892 (70)	64028 (26)	10569 (04)
	Mansehra	86729	47513 (55)	25363 (29)	13852 (16)
	Swat	80048	33624 (42)	21539 (27)	24886 (31)
Goat	KPK	9599017	5975279 (62)	1624074 (17)	1999672 (21)
	D.I.Khan	583923	364414 (62)	159830 (27)	59679 (10)
	Mansehra	316759	256926 (81)	20904 (07)	38929 (12)
	Swat	236229	134855 (57)	16859 (07)	84515 (36)

Large Ruminants: Small < 06 Animals, Medium = 07-20 Animals and Large > 20 Animals

Small Ruminants: Small < 30 Animals, Medium = 31-75 Animals and Large > 75 Animals

Values in the parenthesis are the percentages of total

Source: Livestock Census, 2006

0.87 million house-holds, more than three-fifth (71.20%) were owned by households having 1-4 animals, others 13.7% by house-holds having 5-10 milch animals, 5.4% by the household having 11-20 milch animals while remaining 6.7% of the milch cattle was kept by the household having 21 and above cattle. Similarly, of the total 0.46 million milch buffaloes, reported by 0.27 million households, more than four-fifth (83.30%) were by households having 1-4 animals, others 8.4 % by households having 5-10 milch buffaloes, 3.7% by the household having 11-20 milch animals while remaining 4.7% of the milch buffaloes was kept by the household having 21 and above buffaloes (GoP, 2006). Majority of the herd having 53% of the total cattle was small, 29% were medium and remaining 18% were large cattle farms in Khyber Pakhtunkhwa. Similarly more than three-fifth (72%) of the buffaloes was in the small herds, 19% were in the medium and remaining 9% were in the large herds. Likewise small ruminants, majority of the herd having 56% of the total sheep was small, 22% were medium and remaining 21% were large sheep farms in Khyber Pakhtunkhwa. Similarly more than three-fifth (62%) of the goat was in the small herds, 17% were in the medium and remaining

21% were in the large herds (Table 2).

The increase in population along with rural-urban migration, increase the market demand for dairy products which provides an opportunity to smallholders to improve their living standards, reduce poverty, with a challenge to improve their production costs and productivity. This study is an effort to ascertain the farm level milk production of Khyber Pakhtunkhwa of small, medium and large farms and to compare it with national and international average of milk production.

MATERIALS AND METHOD

Khyber Pakhtunkhwa comprise four agro-ecological regions. After the discussion with the livestock experts of the province and the time and financial constraints, this study was conducted in three agro-ecological regions, i.e., *barani* areas, wet mountains and northern dry mountains (Table 3). One district from each agroecological zone was selected for data collection. Methodology applied for sample selection was developed by International Farm Comparison Network (Isermeyer et al., 2003) and utilizes the concept of typical farms. The concept of typical farms was first used by Elliot (1928) and afterward a number of scientists uses the concept

Table 3. Agro-Ecological Regions of Pakistan

Agro-Ecological Regions	Area
Barani Areas	D.I. Khan, Bannu and Abbottabad
Wet Mountains	Hazara and Mansehra
Northern Dry Mountains	Chitral, Dir and Swat valley

Source: Zahoor, 2007

of typical farms (Taussig, 1939; Marshall, 1952; Hatch et al., 1982; Dillon and Skold, 1992; Uddin et al., 2010; Garcia et al., 2003). The typical farms methodology helps to do synthesis of large area with small sample size selected on the basis of experts. This method is most cost effective and time saving. However, the limitation for this methodology relies on the selection of few typical farms to represent the whole dairy farm population in the area (Uddin et al., 2010). A typical dairy farm is defined (in this study) as a dairy farm in a region in terms of herd size. The farms were selected after the consultation with the local experts by organising a formal discussion so as the selected farm had to represent the region's dairy farm. Three types of farms i.e., small, medium and large selected from each zone was interviewed each for cattle, buffalo, sheep and goats. Therefore, a total of 36 sample farmers were interviewed from different zones of Khyber Pakhtunkhwa, Pakistan.

Data collection was made by a standard questionnaire and data was analyzed using SPSS and Excel software.

Data Collection from the Dairy Farms

Typical farms were selected from each agro-ecological regions (Table 3), belonging to D. I. Khan (*barani* areas), district Mansehra (wet mountains) and Swat valley (northern dry mountains). Thereafter, farm categories were identified such as small, medium and large.

The farm average of milk production of Khyber Pakhtunkhwa was obtained by multiplying the milk production obtained during the survey in 2012 comprising milking ani-

mals of three and above years obtained from livestock census 2006. The data for milk production of National average of various breeds was obtained from different published literature (Afzal and Naqvi, 2003; Iqbal and Ahmad, 1999; Isani and Baloch, 1996, Hussain and Naqvi 2010) (Table 4). The data of milk production in comparison with FAO statistics for Pakistan and world were obtained from FAOSTAT (2010). Milk yield gap and milk production gap was calculated as follows:

- Yield gap = Milk yield in respective scenario - Milk yield at farm
- Production gap = Milk production in respective scenario - Milk production at farm
- Potential = (Yield Gap / Milk Yield at Farm) × 100

RESULTS AND DISCUSSION

Livestock Number and Farm Inventories

The number of animals managed per small, medium and large cattle farm was 5, 16 and 22, respectively (Table 5). The number of animals managed per small buffalo farm was 6, for medium 18 and 27 for large buffalo farms. The number of animals managed per small goat farm was 12, for medium 55 and for large goat farms was 349. The number of animals managed per small sheep farm was 13, for medium 67 and for large sheep herds 187. Herd composition in the study area show that number of unproductive (non-lactating) animals (dry, pregnant and milk fed heifer and male) were more than that of productive animals (lactating) in the study area. More than 3/4 of the cattle at typical farm were non-productive

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Table 4. Milk production potentials of different breeds

Type	Breed	Unit	Average	Lactation length (days)	References
Buffalo	Nili Ravi	(lit lactation ⁻¹)	2300	-	Iqbal and Ahmad (1999)
	Kundi		2000	-	
Cattle	Red Sindhi	lit 305 days ⁻¹	1675	270	Afzal and Naqvi (2003)
	Sahiwal		1852	283	
	Bhagnari		950	262	
	Lohani		613	163	
	Rojhan		735	192	
	Tharparkar		1584	277	
	Cholistani		1471	285	
	Dajjal		900	257	
	Kankreg		1200	-	
	Dhanni		800	204	
Goat	Barbari	Daily milk yield (lit)	1.00	-	Isani and Baloch (1996)
	Kamori		1.8 -2.2	115	
	Beetal		1.8 -2.7	120 -140	
	Dera Din Panah		1.3 -2.2	130	
	Damani		1.1 -1.4	90 -120	
	Gaddi		0.4 -0.7	-	
	Kajli (Pahari)		0.9 -1.3	-	
	Sindh Desi		0.9 -1.8	-	
	Khurassani		0.9 -1.3	-	
	Baltistani		1.1	-	
	Bujri		1 -1.25	-	
	Jarakheil		1.39	-	
	Jattal		0.53	-	
	Jattan		1.5 -3	-	
	Kacchan		2-3	-	
	Kooti		0.71	-	
	Kurri		1	-	
	Labri		1.12	-	
	Pateri		1.0 - 2.0	-	
	Tapri or Lappi		0.5 -1.0	-	
	Gojali	lit 209 days ⁻¹	129	209	Hussain and Naqvi (2010), Afzal and Naqvi (2003)
Sheep	Kachhi	Daily milk yield (lit)	1.09	-	

Table 5. Livestock numbers by farm type

Category	Livestock	Male young/ adult	Female Pregn- ant	Female lacta- ting	Milk fed calf	Female young/ dry	Total
Small	Cattle	-	1	1	2	1	5
	Buffalo	1	1	2	1	1	6
	Goat	2	-	3	3	4	12
	Sheep	1	2	3	3	4	13
Medium	Cattle	4	1	3	3	5	16
	Buffalo	2	4	4	4	4	18
	Goat	5	1	17	11	21	55
	Sheep	3	3	32	3	26	67
Large	Cattle	5	2	5	3	7	22
	Buffalo	4	3	6	6	8	27
	Goat	27	35	120	102	65	349
	Sheep	3	15	68	55	46	187

while only 19 to 23% of the cattle at typical farms were productive (Figure 1). Similarly more than two third of the buffaloes at typical farm were non-productive while 22-33% of the buffaloes at typical farms was productive. In small ruminants, 66-75% of the goats at typical farm were non-productive while 25-34% of the goats at typical farms were productive. Similarly 52-77% of the sheep at typical farm were non-productive while remaining 23-48% of the sheep at typical farms were productive.

Milk Production of Typical Farm in Khyber Pakhtunkhwa

The livestock farmers' of Khyber Pakhtunkhwa purchased animals either from fellow farmers or Livestock markets/*mandi*. The farmers select the animals depending on vi-

suals and milk production. Different factors like breed of the animal, age, calving number, lactation length, dry period, climate condition of the area effect the milk production of the dairy animals. It is necessary for dairy farming that the animal brought to the farm should be healthy and free from diseases. The animal can be assessed by leaving the collection of first time milk, and the average of the next three times milk can give the best idea for milking productivity of the animal.

Nili Ravi (Black Gold) a buffalo dairy breed, was very common in Khyber Pakhtunkhwa followed by Kundi breed however, Azi-Khel breed was found in Swat valley. In Khyber Pakhtunkhwa, the farmers got milk twice a day from the lactating buffaloes. The male calves were normally

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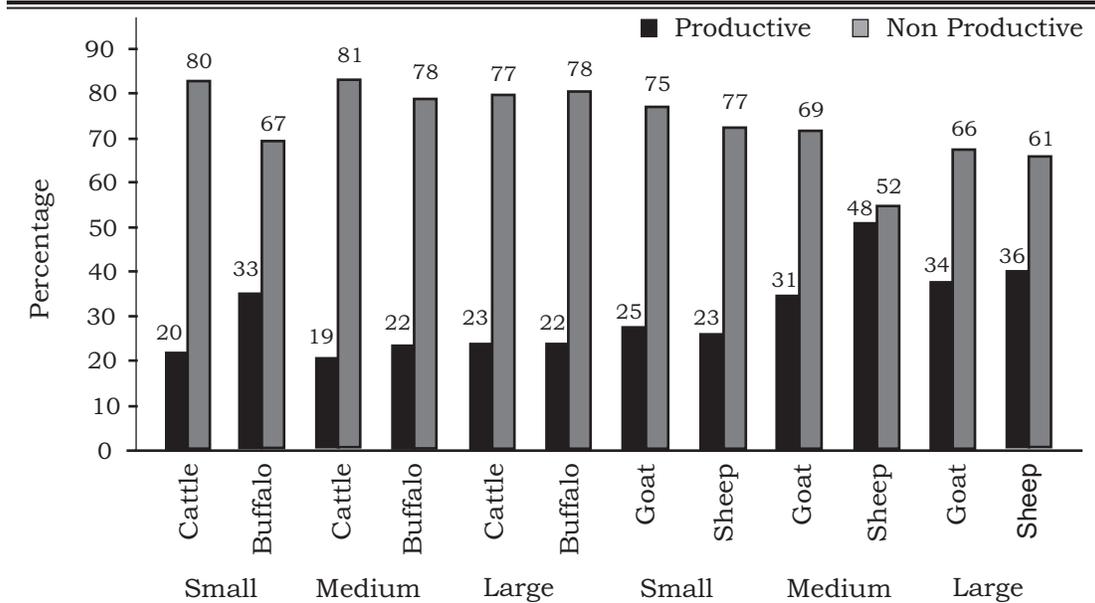


Figure 1. Productive and non-productive animals at typical farm

removed from the mother soon after birth to save milk. The lactation length for the buffaloes of small, medium and large typical farms was 242, 245 and 230 days, respectively. The total milk production during a lactation period was 1636 lit, 1471 lit and 1631 lit for small, medium and large dairy buffalo farms, respectively. The reason for higher milk

production by small farmers may be the efficient uses of their resources. It was also observed during the survey that the small farmers had replaced the inefficient milk breed animals by small number of higher milking breed animals. The large farmers had more resources and having good milking breed animals which were efficiently managing their farms. The medium

Table 6. Milk production of the large ruminants typical farm

Category	Buffalo			Cattle		
	Small	Medium	Large	Small	Medium	Large
Lactation length (days)	242	245	230	199	196	184
First quarter milk (lit)	586	470	672	310	207	241
Second quarter milk (lit)	463	479	469	213	181	192
Third quarter milk (lit)	340	334	256	156	142	124
Four quarter milk (lit)	247	188	234	101	53	73
Total milk production (lit)	1636	1471	1631	780	583	630

* One quarter = lactation length (days) ÷ 4

Table 7. Milk production of the small ruminants typical farm

Category	Goat			Sheep		
	Small	Medium	Large	Small	Medium	Large
Lactation length (days)	108	103	107	129	124	130
First thrice milk (lit)	56	49	35	33	27	28
Second thrice milk (lit)	42	40	25	23	20	19
Third thrice milk (lit)	14	14	11	21	12	10
Total milk production (lit)	112	103	71	77	59	57

* One thrice = Lactation length (days) ÷3

farmers had a mix breed of animals at their farms (Table 6).

Cattle breeds like Sahiwal, Achai, desi (undescriptive), Damani and Friesian were found in the typical farms of cattle. The dairy farmers milk dairy cows twice a day. The lactation length of cattle ranged from 184 for large typical farms to 199 days for small typical cattle farms. The lactation length for typical medium cattle farm was 196 days. The total milk production during a lactation period from small, medium and large farms per animal was 780lit, 583lit and 630 lit, respectively (Table 6).

Goat also known as “poor man's cow” as it is small, takes less food and provides milk and meat for a family. A number of different breeds of goats i.e., *desi* (undescriptive), Damani, Beetal, Sargodha, Kolachi etc were found in the study area. The farmers milk dairy goats twice a day. The medium and large farmers mostly feed the kid from milk. Sometime the milk by medium and large farmers were used for home consumption also. The lactation length ranged from 103days for medium typical goat farm to 108 days for small typical goat

farm. The lactation length for large goat typical farm was 107 days. The total milk production during a lactation period from small, medium and large typical farms per animal was 112 lit, 103 lit and 71 lit, respectively in the study area (Table 7).

Damani, Farmi, Pahari, Desi (undescriptive), Ajree, Kaghani were sheep breeds found in the typical farms. Mostly the farmers did not milk sheep. The lactation length ranged from 124days for medium sheep typical farms to 130 days for large sheep typical farms. The lactation length of small sheep typical farm was 129 days. The total milk production during a lactation period from small farm per animal was 77 lit, from medium typical farm was 59 lit and 57 lit from large farms (Table 7).

Yield and Production Gaps

The yield and production gap were estimated in three scenarios. Firstly, if the milk production of Khyber Pakhtunkhwa achieve the national average i.e., if all the animals produce on average the equals to the milk production at farm level. Second, if the present milk production of

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all animals equals the average of milk production of Pakistan and third if the milk production of Khyber Pakhtunkhwa reached the average of the world milk production. The data shows that the present milk production of Khyber Pakhtunkhwa is 2.74 mt with 1579lit of milk per buffalo per year, 663lit of milk per cow per year, 95lit of milk per goat per year and 64lit of milk per sheep per year (Table 8). The data in comparison to the national average, FAO (2010) and World (2010) is far below from probable production levels. Except in buffaloes and goats where the farm level production of milk is higher than the World (2010) and sheep where the farm level production of milk of Khyber Pakhtunkhwa is higher than Pakistan (FAO, 2010; World, 2010). Overall the milk production of Khyber Pakhtunkhwa can be increased upto 5.82 mt by proper management and genetic improvement.

The data shows that the present milk production of Khyber Pakhtunkhwa can be increased upto 5.82 mt by genetic improvement and proper management. It is recommended that the new genetically improved breeds of dairy animals, be cost effective and suitable to the climatic conditions of the area should be introduced to increase the productivity. Furthermore, more research needed at farm level in the context of breed adaptability and management in respect of Livestock herds and cost of production in Khyber Pakhtunkhwa, Pakistan.

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Table 8. Milk yield and milk production gaps in Khyber Pakhtunkhwa

Type	Farm Average				National Average				Pakistan (FAO 2010)				World (FAO 2010)					
	Animal (No)	Lit/ Lact- prod ation (mt)	Milk Lit/ Lact- prod ation (mt)	Milk prod (mt)	Yield gap (lit)	Prod gap (mt)	Potent- ial (%)	Lit/ Lact- prod ation (mt)	Milk prod (mt)	Yield gap (lit)	Prod gap (mt)	Potent- ial (%)	Lit/ Lact- prod ation (mt)	Milk prod (mt)	Yield gap (lit)	Prod gap (mt)	Potent- ial (%)	
Buffalo	808068	1579	1.28	2150	1.74	571	0.46	36	1935	1.56	356	0.29	23	1526	1.23	-53	-0.04	-3
Cattle	1874657	663	1.24	1178	2.21	515	0.96	78	1230	2.31	567	1.06	85	2351	4.41	1688	3.16	254
Goat	1198390	95	0.11	148	0.18	53	0.06	56	142	0.17	47	0.06	49	85	0.10	-10	-0.01	-11
Sheep	1648774	64	0.11	142	0.23	77	0.13	120	50	0.08	-14	-0.02	-22	44	0.07	-20	-0.03	-32
Total (million tonnes)	-	2.74	-	4.36	-	1.62	-	-	-	4.12	-	1.38	-	-	5.82	-	3.08	-

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