

Characteristics of village milk production in the Punjab of Pakistan

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Abstract

A growing population, especially in urban centres, increased per capita income and improved infrastructure have opened considerable markets for rural milk producers in the Punjab of Pakistan over the past decades. The current study aims to investigate the reactions of farmers to these changes and to provide the basis for the formulation of development strategies. A cross sectional survey on milk producing households and a longitudinal survey on milk production with buffaloes and cattle were conducted in the central region of irrigated Punjab during 1997 to 1999. Initial results indicate that production practices are still reminiscent of subsistence orientation, as most dairy producers are not yet willing to invest in inputs to achieve increased productivity.

Keywords: milk production, buffaloes, productivity, Pakistan

Introduction

The province of Punjab in Pakistan is characterised by its canal irrigation system, which forms part of the largest irrigation system world-wide. Large rivers coming from the Himalayas flow through the semi-arid alluvial plains, irrigating roughly half of the provincial area as can be seen in figure 1. On its inception about a century ago the aim of the irrigation system was to produce wheat for the Indian subcontinent. Today wheat, which is grown in the winter months, is still the most important crop. However, the introduction of more intensive farming methods has enabled the introduction of a number of further crops over the last decades. The most important of which are cotton, rice and sugar-cane (Bureau of Statistics, 1996). Nevertheless, fodder crops play an important role, occupying about 15% of the cropped area. The most important fodder crops are berseem (*Trifolium alexandrinum*) for the winter season and sorghum (*Andropogon sorghum*) and maize (*Zea mays*) for the summer season.

Figure 1. Location of survey area



The favourable conditions for agricultural production have allowed the development of a high population density, the average of which is 360 persons/km². The majority of the population (70%) still lives in rural areas, but the emergence of large urban centres over the last decades has had a profound influence on the whole province. The development of industrial production and urban purchasing power has led to a growing demand for non-agricultural labour and for agricultural products. The effects of this are felt even in remote villages. Although crop production is generally thought to be of overriding importance, animal production contributes roughly one third towards the value added of agricultural production (Finance Division, 1997). Considering the number of animals being kept in the Punjab, this is not surprising. The 1996 livestock census reported following figures: Buffaloes 13.1 million, cattle 9.4 million, goats 15.3 million, sheep 6.1 million and donkeys 1.9 million. Buffaloes, the major livestock species, are kept nearly exclusively for milk production. Cattle on the other hand, are mainly utilised for draught purposes in the irrigated areas. Small ruminants are mainly kept for meat production, goats being more important in the Punjab than sheep. Goat meat enjoys the highest preference and accordingly fetches the highest market prices. However, both large and small ruminants are mostly kept only in small numbers per household. The only exceptions are herders, which keep mainly sheep with some goats. Average herd sizes in the Punjab are 3.8 buffaloes, 3.6 cattle, 4.9 goats and 9.4 sheep (Agricultural Census Organization, 1998). Most of these livestock-keeping households are small farmers or landless. The reason being, that until only one or two decades ago, the sale of milk was not acceptable in the traditional rural society (Ecker, 1981) and specialised meat production has never developed as a commercial activity with farmers. Nevertheless, milk production has been of great importance to rural households for centuries. It has provided the household with the preferred forms of protein and fat (ghee, i.e. butter oil) as well as a means of social security. A buffalo represents a significant value, which can be disposed of without difficulty in times of need (Kuhnen, 1989). However, over the last decades the taboo on sale of milk has generally been overcome. In fact, there are hardly any households not selling milk. Therefore, the emphasis of objectives is shifting from subsistence and risk minimisation to income generation (Irfan, 1990; Teufel, 1998). Over the past decades many development efforts have taken place, but with only limited impact (Saji and Jost,

1982). It has been accepted that a proper understanding of rural producers is a prerequisite for the planning of development policies (Kuhnen, 1993).

Based on this background, the current study aims to achieve following objectives:

- analyse the economics of milk production on household level,
- identify constraints & potential improvements,
- evaluate potential improvements.

Thereby, following hypotheses are to be tested:

- Milk production contributes significantly towards household income.
- Further intensification of milk production is attractive.
- An effective development approach can be identified.

At this stage, mainly the structure of the study will be presented with some first results regarding productivity of milk production.

Material and methods

The basic structure of the study is as follows:

- collection of primary data from milk producers in the Punjab through formal and informal interviews as well as physical measurement of input, output and herd parameters,
- data analysis regarding
 - resources of milk producers,
 - their objectives regarding milk production and household decisions in general,
 - technical coefficients of milk production,
- definition of representative milk producing households and construction of respective household models,
- identification of major constraints and formulation of improvement options on the basis of the collected data as well as modelling results,
- evaluation of suggested improvement options according to the results yielded by the household models.

Data collection was restricted to an area 100 km south-west of the provincial capital Lahore on both sides of the river Ravi. The area is known for its long-established milk production. Formal interviews were conducted in two phases. Initially, 322 dairy animal keeping households were randomly chosen and interviewed in August/September 1997 on such topics as resources, farming and non-farm activities, objectives and details of milk production. Based on these data, factors with the greatest influence on annual milk yield were identified with which milk producing households were classified.

During a second formal survey, 67 households, which had been selected according to the previously defined classes, were interviewed monthly from March 1998 to April 1999. Concurrently, village assistants recorded milk yield and milk fat content of the households' dairy animals, which had initially been tagged and registered. These assistants also measured fodder composition, fodder consumption and concentrate consumption in the participating households. During each monthly visit, farmers were questioned about herd developments, the animal health situation, grazing, milk use, labour requirements and major expenses and income. In addition, special topics were covered in greater detail, such as animal breeding practices or land use during the summer cropping season.

Results and discussion

At this stage some initial results are to be presented, which will enable the comparison of resource and productivity figures with results reported in earlier studies. Based on results from the first survey, table 1 gives an overview of the structure of milk producing households in the survey area.

Table 1. Characteristics of milk producing households (n = 322)

		households [%]	amount (median)
persons		100	9
land	owned	62	2.8ha
	cultivated	73	2.8ha
buffaloes	total	97	5
	adult female	96	2
cattle	total	55	2
	adult female	31	1
goats		58	3
sheep		11	2
donkeys		70	1

The household structure of milk producers covered by the survey follows the general perception on rural Punjab society: Smallholder farmers dominate, with a high proportion of landless households (Haider, 1993). It is interesting to note that land cultivation was found more often amongst the surveyed households than land ownership. This could indicate that despite growing industrialisation, the demand for agricultural land is still high. Livestock numbers also follow the familiar pattern: Buffaloes are the most important species. However, herds are generally small. The difference in popularity of cattle and adult female cattle (i.e. cows) is explained by the fact that more households keep bullocks (i.e. castrated males) for draught purposes than adult female cattle for dairy production. Donkeys are popular, because they provide the means for the daily transport of fodder from the fields to the homesteads. The data from the first survey were also used to identify factors with an influence on annual daily milk yield, taken as measure of production intensity. The following three factors showed the greatest impact:

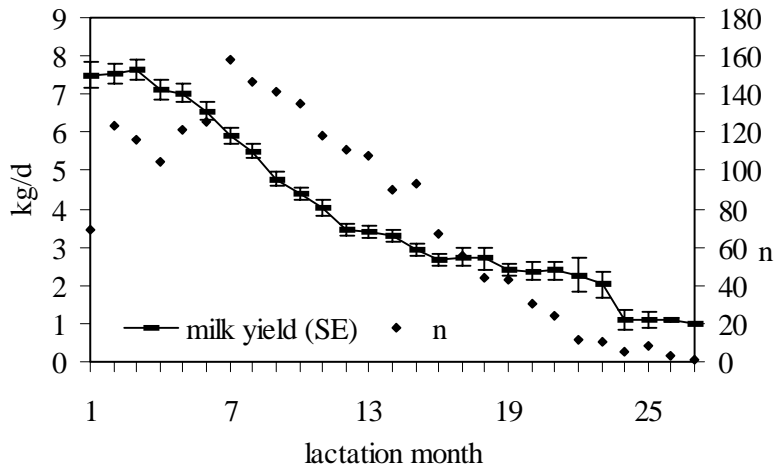
- level of concentrate feeding (as proxy for intensity of input use),
- amount of land owned (as proxy for resource endowment),
- major non-farm income (as proxy for subsistence orientation of milk production – if a significant proportion of the household income is derived from non-farm activities, dairy animals will be mainly kept to fulfil household subsistence needs).

Defining two classes per factor, with the median value of concentrates (2kg/d) and land owned (0.8ha) as class borders, resulted in a total of eight household classes. According to this classification, about eight households per village were selected in eight villages for the second survey.

Initial analysis of productivity is based on data from the second survey. It focuses on major outputs (milk yield, milk fat content) and major inputs (fodder, concentrates, survival) of milk production with buffaloes. Their monthly milk records allow the construction of an average lactation curve, as shown in figure 2. The significant decrease in daily milk yield after five months is in contrast to the general opinion, that buffaloes are persistent milkers (Bode,

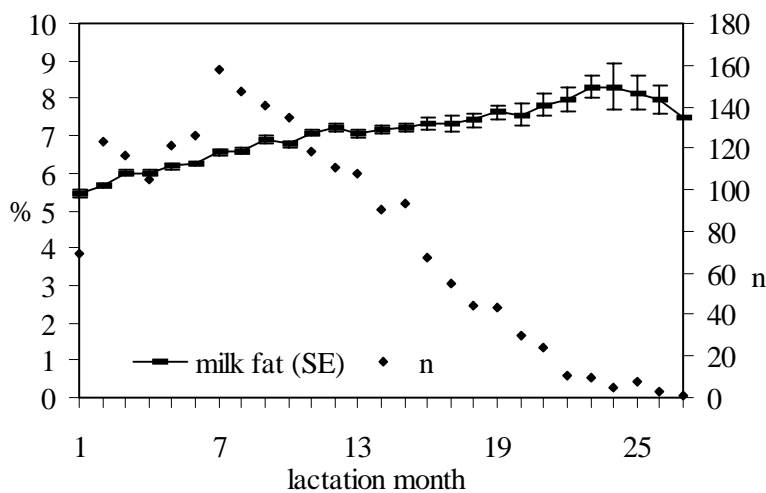
1989). The levelling off of the lactation curve after sixteen months should be considered with care, as the number of animals still lactating at this stage is greatly reduced. Average lactation length is about 15 months.

Figure 2. Average daily milk yield of buffaloes



The results on average milk fat content, shown in figure 3, are similar to previous findings, which state that buffalo milk has a milk fat content of around 7% (Sindhu and Singhal, 1988). The current results show a gradual increase from around 5.5% to 8% with an average of 7%. Large standard errors in later months are due to limited record numbers.

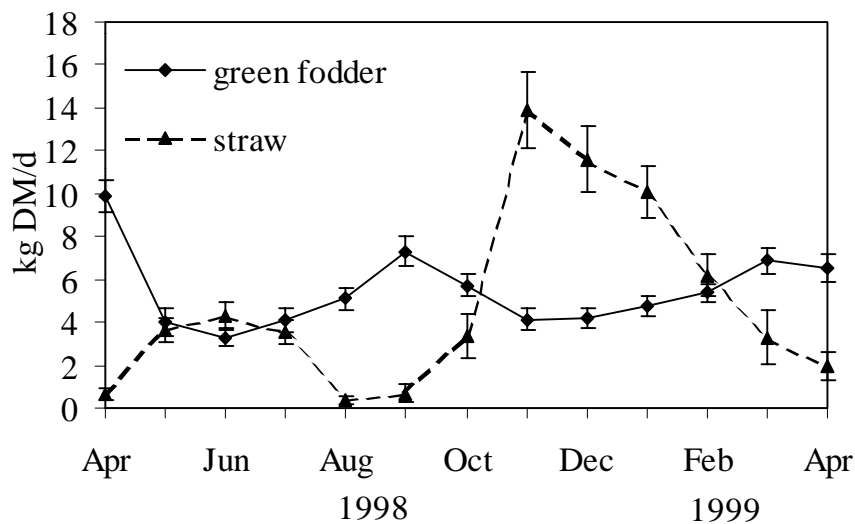
Figure 3. Average milk fat content of buffalo milk



It has long been acknowledged that the major constraint on the input side is the great variability of fodder availability. The seasonal variation of the amount of green fodder and straw fed to a lactating buffalo, as given in figure 4, shows this graphically. Two difficult periods stand out: In Mai/June it has become too hot for berseem, the winter fodder crop, to flourish, while the summer fodder crops, sorghum and maize, have not yet sufficiently developed. In November/December summer fodder is no longer available and berseem is not

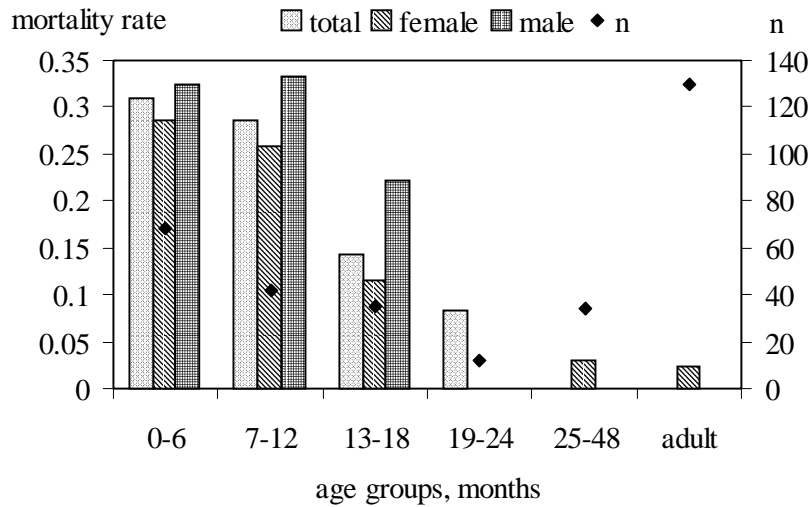
yet ready for harvesting. It is obvious how farmers compensate the lack of green fodder with increased straw feeding. In spring this is wheat straw, in autumn it is rice straw. However, the peak in autumn straw feeding, resulting in a total dry matter intake of about 18kg/d, is not readily explained. It could be, that the rice straw fed might have had a higher moisture content than the 12% given as standard value (Close, Menke et al., 1986). In autumn, when rice is harvested, temperatures are lower and there is more rain than during the wheat harvest in spring. It should also be noted that the amount of green fodder fed in April 1999 was considerably lower than in April 1998. This is most certainly due to the unusually long period of low temperatures during the winter of 1998/99. This also explains why green fodder feeding hardly increased after November 1998. This in turn would suggest that even in such a controlled environment as the irrigated areas, data from a single year might not produce sufficiently representative data.

Figure 4. Fodder supply per adult female buffalo



The mortality rates of buffalo calves found during the survey and shown in figure 5 were far higher than previously reported (Heuer, 1996). This is partly due to the fact, that in contrast to the current study most epidemiological surveys are based on recall. In the case of animal mortality this produces highly inaccurate results, as it is culturally unacceptable to discuss death losses openly. On the other hand, a survival rate of only about 50% for the first twelve months, as shown by the current results, seems to be insufficient to sustain the herd. Again, the explanation might be the severe winter, which resulted in higher than average disease incidences and more severe fodder shortage. This would affect calves directly and also through the reduced milk production of their dams.

Figure 5. Mortality of buffaloes



Finally, an overview over the most important data on productivity of milk production with buffaloes is presented in table 2. Current data on outputs, i.e. reproduction and lactation, as well as inputs, i.e. feeding and fodder, are within the range of the earlier studies. While variation is considerable, a significant development of productivity is not apparent. The exceptions are calf mortality rate, which has been discussed above, and the amount of straw fed, which is slightly higher in the current survey, compared with previous studies.

Table 2. Comparison of productivity data of milk production with buffaloes

		Ecker (1981)	Jost (1984)	Ahmad, Hussain et al. (1993)	Present milk production survey
inter calving period	d	503	560	702	572
lactation milk yield	kg				2432
annual milk yield	kg	1925	1084	1400	1552
milk fat	%				7
age at first calving	m		47		54
mortality, calves (0-12m)	/12m		0.22	0.20	0.49
mortality, adult females	/12m		0.01	0.07	0.02
green fodder	dt/12m		100	120	115
straw	dt/12m		16	18	21.5
total fodder	dt/12m	191			
concentrates	dt/12m	5.7	0.72	3.2	1.8

Conclusions

At this stage one might ask if there is any need for a further comprehensive study on village milk production in the Punjab of Pakistan, if there is no discernible development of productivity. However, this result alone would be sufficient justification, as the economics of

milk production have been changed fundamentally through improved marketing. One would therefore expect, that as the contribution of milk production to monetary household income has increased, a greater willingness to invest in inputs would follow, resulting in higher productivity. A more detailed analysis will investigate whether developments have taken place, which have not yet affected the main productivity criteria. and why farmers are not willing to pay for inputs despite receiving higher monetary returns.

Most importantly though, the current study provides a wide variety of physical and recall data from within the participating households, which allow a more comprehensive analysis both of production as well as economic and social aspects than was possible within previous studies:

- a classification of households in regard to criteria, which are relevant to milk production,
- an analysis of objectives in relation to household resources and activities,
- the construction of household models, which not only consider income maximisation, but also include further important household objectives in the objective functions such as risk aversion, liquidity and household consumption,
- the determination of production constraints and definition of improvement options on the basis of information gathered from households, professionals as well as household model results,
- the evaluation of the defined improvement options on the basis of household models.

An additional aspect will be the investigation into the current process of transforming milk production from being purely subsistence to becoming market orientated. Thereby furthering the understanding of why farmers are currently not willing to pay more for inputs despite the improved marketing situation. The results will provide policy makers with a greater understanding of their clients, the rural milk producers. A greater awareness of their decision making process will assist with the formulation of more relevant development strategies.

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