



# The Economics of Milk Production in Cajamarca, Peru, with Particular Emphasis on Small-scale Producers

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## EXECUTIVE SUMMARY

### Introduction

The main purpose of this study was to gain insight into the household and farm economics of small-scale dairy farmers in the highlands of Cajamarca, northern Peru, and to obtain estimates of their costs per unit of output in milk production so as to gauge their potential for improvement of their dairy enterprise, particularly through policy action, and to assess their vulnerability to international competition in a more closely interconnected world market. In order to ascertain possible developments in the dairy sector and to broadly identify areas of intervention that favour small-scale dairy producers, the study examines the potential to improve milk production of the predominant farm types. Exploratory analyses on the distribution channels of both feed inputs and milk outputs in the region were carried out. Lastly, a case study approach is used, whose main aim is to obtain qualitative insights rather than to permit quantitative extrapolation.

### Methodology

The methodology applied for the economic analysis was developed by the International Farm Comparison Network (IFCN) and builds on the concept of typical farms. Farm types are determined by regional dairy experts taking into consideration (a) agro-ecology and location of the farm, (b) farm size in terms of herd size and (c) the production systems that make the most important contributions to milk production in the region. The following three farm types were found to represent over 75, 90, and 95 percent of the regions' milk production, cow numbers and farm numbers respectively. The first type of farms (5 cows) represents the typical dairy farm in the Jalca-Ladera area (>2,800 masl<sup>1</sup>); the second category (6 cows) was chosen to represent the majority of dairy farms in the high intra-mountainous valleys (2600 to 2800 masl\*), and finally, a third farm type (13 cows) represents the typical production system found in the Cajamarca valley (2500 to 2600 masl\*). Management levels on the farms selected for the study are average to slightly above average compared to other farms of the same type. Data was collected using a standard questionnaire and a computer simulation model, TIPI-CAL (Technology Impact and Policy Impact Calculations), was used for biological and economic simulations of the farms. Furthermore, method testing exercises were conducted regarding the feed chain analysis. The methodology used is further explained in the corresponding sections and/ or the Annexes at the end of the paper.

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<sup>1</sup> masl: metres above sea level.

## Results

### Milk Production in Peru

Milk production in Peru increased at a rapid rate of 4.5 percent annually between 1996 and 2003. This production growth has been driven by: better access of the main dairy processors to the remote highland producers, a growing number of dairy farms (2.2 percent per year), and better milk yields (2.5 percent increase per year). However, the period 2002-2003 shows a milk production growth reduced to below 3 percent.

Even with the steady growth of over 4 percent per year and stable investments in the three main milk sheds, Peru imports about 25 percent of its milk consumption. In addition, the government spends an approximate US\$ 200 million a year on milk and milk products for its governmental food assistance programs.

### Analysis of 'Typical Farms' in the Region of Cajamarca, Peru

Based on the IFCN methodology, three farm types were identified as 'typical' and were subjected to detailed analyses. A small dairy farm, PE-5 (located in the Sierra, holding 5 crossbred and Holstein Friesian cows, with 5.55 ha of land mostly for natural grass and some cash crops for own consumption), PE-6 (located in a typical high Cajamarcan valley, 6 Holstein Friesian and Brown Swiss cows, and 7.60 ha land with natural grass, cultivated pastures and some cash crops for own consumption), and a more 'progressive' farm, PE-13, which represents the more commercially-managed dairy systems in the area (located in the Campina, near the city of Cajamarca; holding 13 Holstein Friesian cows, with 7.30 ha land for cultivated pastures and no cash crops). Furthermore, these farm types selections cover the predominant socio- and agro-climatic conditions governing milk production in the Andean regions.

### Dairy Production Systems

In the last two decades, dairy has gained relevance as a key component of the typical farming systems. This fast growth in milk production (>4 percent per year) can be attributed to the increasing milk demand of the dairy processing sector. The growing and secure market has provided a major incentive for private investors around Lima as well as small and remotely located farmers in the highlands to produce more milk. Dairy farms around the capital are relatively large, cows are stall fed, use much concentrates (resulting in high costs of production) and obtain high milk prices while in Cajamarca, the predominant farming system combines crops and animal production to best utilize the available resources and to assure a higher income throughout the year.

Dairy farming in Cajamarca varies strongly across farming systems, depending on the socio- and agro-climatic conditions, dominating factors being access to water and altitude. Farms at the high end of the Sierra usually have about 2 to 5 crossbred dairy cows grazing natural pastures. With no irrigation, this system can carry less than one animal per hectare of pasture and faces severe fodder scarcity during the dry season (May to October). During the rainy months, several cash crops are grown on lower sites mostly for home consumption.

A second 'typical' dairy farming system is found in high intra-mountainous valleys, which can be irrigated by using small rivers. Here, farms have 4 to 6 Holstein Friesian cows, which are fed some concentrates. Market access is relatively good and farmers cultivate pastures all year long. Fodder conservation for the dry season is not practiced. Some cash crops are grown for home consumption. In the valley of Cajamarca, milk production relies on more concentrates, better genetics and often mechanized milking. Although, farmers here count with higher milk prices and milk yields per animal, their production costs are also high in comparison with the other system described here. Therefore, it appears that milk production in Cajamarca is 'moving up the Sierra'.

### Household Comparison

This study shows that typical dairy households in Cajamarca have daily per capita incomes of US\$1.5 and 2.0 for PE-5 and PE-6, both in the rural sierra. For the urban sierra location, PE-13 achieves an income of US\$ 9.5 per capita per day, which is more than double and triple the urban sierra and national Peruvian average daily income found by the World Bank respectively.

From another perspective, the total annual household incomes range between US\$ 2,200 and 10,500. The net cash farm income accounts for 95 and 55 percent of the household incomes for the small and large farms respectively.

Non-cash benefits are most relevant for the smallest farm. However, even for PE-5, non-cash benefits (milk and manure) reach a low 5 percent of the household income due to the fact that typical dairy farm families, in the Andes, both consume little milk and the manure is spread on the fields by the grazing animals themselves. By contrast, in countries such as India, a small dairy farmer would add value to both milk and cow-dung used by the family. This in turn increases the relevance of non-cash benefits from the dairy.

All three households merely cover their family living expenses and only the largest, peri-urban farm can save about US\$600 per year.

### **Whole Farm Comparison**

The farm returns range from US\$ 3,200 to 20,300 per year. Over 80 percent of the farm returns for the two smaller farms come from the dairy and the rest from cash crops. Some small ruminants are also raised for home consumption. The larger farm is fully specialised in dairy and forage production.

All farms have excellent profit margins, which are in the order of 70 and 30 percent for the smallest and largest farm.

### **Comparison of the Dairy Enterprise - Costs of Milk Production**

The total cost of milk production varies from US\$ 28 to 23 per 100 kg ECM. The farm PE-6's low production costs (US\$ 23) are mainly due to lower costs of family labour. However, when only cash costs are considered, PE-5 has no costs (due to using family labour and natural grasses only) while the other two farms have cash expenses of US\$ 5 and 15 per 100 kg ECM (for purchased concentrates and inputs for cultivated pastures).

The returns between the farms differ between US\$ 29 and 35 per 100 kg milk. Differences in milk returns can be explained by farm location in relation to the city of Cajamarca, milk quality (bonuses for fat content, acidity and tuberculosis and brucellosis status), and the farmer's price-negotiating power.

Due to milk yield differences, the returns of the small farm are 60 and 40 percent from milk and cattle sales; while for the larger farm 75 percent of the returns stem from milk sales.

The dairy returns from working on the dairy enterprises of the two smaller farms are about 65 percent of the local wages. However, the return to labour on the larger farm surpasses the local agricultural wages by 8 percent (high labour productivity).

### **Dairy Chain in Cajamarca**

About 75 percent of the milk produced in the province of Cajamarca reaches the formal processing sector, namely Nestle or Gloria S.A. However, farms producing less than the minimum daily quantity required by these companies (15 kg milk) or those not located on the formal milk collection route usually process their milk or sell it to small dairy processors, mainly cheese-makers. Cheese-making catches about 24 percent of the province's milk output, which is converted into quesillo (a fresh curd cheese, which forms the basis for the popular queso cremoso, a creamy Cajamarcan cheese). The remaining one percent left is estimated to be consumed by the farm households themselves.

Producer milk prices are US\$ 0.21 and 0.24 per kg in the formal and informal sectors respectively. However, the consumer price is 2 times greater for the formal sector's evaporated milk, which has a long lasting and well established acceptance.

The margins attained from processing and retailing are US\$0.40 and 0.07 per kg of evaporated milk and fresh (cheese) curd in the formal and informal channels respectively.

Lastly, farmers' shares in the total consumer prices are 35 and 78 percent in the formal and informal channels. In similar studies for Asian countries, farmers capture lower shares (below 30 percent) than Cajamarcan farmers. Regarding the informal sector, Cajamarca has the peculiarity that farmers, who are not linked to the main milk collectors, convert their milk into cheese curd. This simple processing step not only lengthens the shelf-life of the milk, but also adds value to it. Because of this value-adding the farmers' share of the consumer price is extremely high, particularly compared to dairy chains in South Asia. It is estimated that cheese-makers could increase their profitability and maintain the higher milk price paid to farmers if they were better trained.

## Feed Chain in Cajamarca

Dairy farmers in Cajamarca feed small amounts of complete feed mixes as supplements to both cultivated and natural pastures. Others purchase and feed wheat middling (mostly from imported wheat), cottonseed meal (domestically produced), and mineral and vitamin premixes (mostly from imported ingredients) separately and on a per cow basis. This study shows that about 29 percent of the feed price paid by the dairy farmers is to cover costs of transportation, processing, and retailing from the primary distributor in Lima to the farms in Polloc, Cajamarca. Poor conditions of the road system linking the highlands to the coast and its vulnerability to bad weather makes the transportation of inputs into and milk out from the highlands difficult for the dairy industry. Clearly, the Cajamarcan dairy industry would benefit greatly from a more competitive road infrastructure system linking it to the growing markets in the coastal regions.

## Conclusions

Several key conclusions emerge from this study:

1. Increasing milk production in Cajamarca is profitable for the farm types studied in the sierra, and appears to be a good strategy for the country as a whole since international milk powder prices are most likely to increase, significantly raising Peru's import bill.
2. The most limiting factor for farmers shifting to milk production in the high sierra, where PE-5 is located, is access to irrigation water. Rainfall is seasonally distributed with a pronounced dry season from May to October. Despite this fact, PE-5 practices no forage conservation at all, which may largely explain its low milk yield of about 1,600 kg per year per animal, or 55 percent of the yield reached by PE-6. The practice of cultivating improved pasture and/or better utilization of natural ones is required for PE-5 to cost-effectively enhance its income and create a base for other dairy improvements, such as better breed and herd management.
3. PE-5 shows very poor herd performance indicators such as high mortality rates, high ages at first calving and long calving intervals. Improvements in herd management would positively impact the profitability of this farm type. This can be done by partnering with the private sector and NGOs already operating in the area. Such services could then expand to adjacent regions, not yet served.
4. Dairying is a highly risky activity in the sierra. The study shows that households with off-farm income make higher investments in milk production, which in turn leads to higher farm incomes. Off-farm incomes seem to have two key impacts on the dairy enterprises: (1) increasing the household's capacity to make investments in income generating activities, and (2) decreasing the total household income risk level, so it can invest in riskier activities.
5. Significant parts of both the consumer prices for dairy products and the farmer prices for feedstuffs go towards covering processing, transportation, and retailing costs. Investment in roads, markets, energy and telecommunications are expected to decrease these costs. Dairy development in the region will demand more efficient chains that connect the high sierra farmers with the coastal markets for both farm inputs and outputs.
6. Small dairy farmers in Cajamarca, disconnected from the main dairy processors, convert their milk into curd and sell it to cheese-makers. Cheese curd production allows the farmer to add value to the milk and to capture a relatively high share of the final consumer price. This decreases the profitability of the typical small cheese-making operation, which seems to be

disappearing rapidly. There is a strong need to evaluate the role and economics of the small local cheese-makers and their potential role as a developmental actor to serve small dairy farmers excluded from the formal dairy processing stream and the local consumers.

7. Milk production in the country has been increasing at about 4.5 percent annually for the past decade. However, milk production seems to increase in the confined-intensive systems of the coasts at a much faster pace than in the Sierra. Therefore, there is a need for a comparative study to assess if the sierra-coast gap in milk production is widening or not.
8. In general the productivity of livestock in the sierra is low. The major cause is said to be poor animal nutrition, particularly during the dry season. To improve nutrition forage production must improve. Livestock development entities have promoted the use of cultivated pastures, but their programs have been successful only in areas where irrigation is possible and where no direct competition with cash crops exists. Regarding native rangelands, the potential impacts of their improvement may be far reaching due to two main reasons: (a) improving native rangelands has the potential to increase daily milk yields from the current 3 kg up to 6 and even 8 kg per animal per day; and (b) most of this yield increase could be captured by small-scale dairy farmers, who rely heavily on rangeland pastures as the most important nutritional component for their (dairy) animals.
9. Peru faces an unfavourable milk-feed price ratio, which is due to high concentrate prices. This study shows that feed distribution channels in Cajamarca have high transportation costs and many intermediaries, both of which significantly increase the prices of feedstuffs at the farm gate. There are local initiatives addressing this feed price issue, whose (pro-poor) impacts can be enhanced through partnerships.