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Private and Social Profitability of the Azores Dairy Industry

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## PREFACE

This report stems from a decision to include Azorean dairy systems in the overall PES team research on private and social profitability of Portuguese agriculture. The data were collected during brief visits to the Azores during June and September, 1983. The authors would like to thank the many people who gave generously of their time to educate us in the ways of Azores dairy farmers and processors, in particular, Dr. Luis Henrique Sequeira Medeiros, Jr., and Dr. Jose Leal Armas, both of the Veterinary Services of the Secretariat for Agriculture and Fisheries, RAA. They, and the others who helped us, are not to be blamed for the use to which we have put the information nor the accuracy of our interpretation and results.

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## INTRODUCTION

The Azores are a group of islands about one-third the distance from Portugal to North America. They constitute an autonomous region of Portugal with powers of self-government guaranteed by the Portuguese Constitution. The islands support a population of one-quarter of a million. The main agricultural industry on the islands is livestock farming, with an emphasis on the production of dairy products for export to the mainland of Portugal. The output of these dairy products comprises about 23 percent of total Portuguese production.

The Azores dairy industry is quite different from the mainland dairy systems already studied by the PES team in terms of private and social profitability. High milk output results from the use of fertile grasslands. Herd size surpasses that of many areas of the mainland, and the quality of cattle is high. Skillful use of pastures at different altitudes allows dairy herds to remain outside at all times of the year and minimizes the use of purchased feed. The processing sector moves most of the milk to the mainland in either curdled or powdered forms. Milk powder is the major item in this trade and serves as a basic raw material for mainland cheese, butter, and special products factories. Since change in the relative price of milk products upon accession to the EC could have different and very significant impacts upon the Azores sector, it was considered necessary to examine Azorean dairy systems as an important component to the more comprehensive PES work.

This report is a brief account of the social and private profitability of the dairy industry in the Azores and of the likely changes that will follow Portuguese membership into the EC. The results will be incorporated into the PES analysis of the profitability of Portuguese agriculture already begun.

### Milk Production In the Azores

The general economy of the Azores revolves around the production and the processing of raw milk. The archipelago depends extensively on its ties with outside markets, for both sources of needed consumer goods and outlets for domestic goods. Dairy products-- milk powder and cheese--represent close to 70 percent of the total value of Azorean exports. In 1981 prices the value of processed dairy products was estimated at five million contos (approximately 150 million dollars). More than half the active population of the Azores is employed in agricultural pursuits and one in eighteen Azoreans is a dairy producer.

Milk production in the Azores has a relatively recent history. During the 18th and 19th centuries, orange trees covered large parts of the islands, and oranges were exported to England as a remedy for scurvy. When disease destroyed the viability of citrus, Azorean farmers turned to basic mixed farming with an emphasis on such high-value crops as tobacco and pineapples. Milk production became significant during the first three decades of the current century, but since the Second World War, increased from 34 million liters in 1940 to current levels of 200 million liters. Dairy farming now dominates the social and economic panorama of the islands.

In 1982, about 200 million liters of raw milk were collected by local processing firms on the seven major islands. The Azores have only 16.6 percent of the mainland dairy herd, but nearly all of the animals come from high quality breeds. There is an accentuated seasonal variation in production in which summer volumes of milk increase to twice those of winter months; however, this variation coincides almost exactly with oscillations in the mainland's milk supply. Since the Azores export nearly all their processed dairy products to the mainland, problems of oversupply occasionally occur. The

Islands of Sao Miguel and Terceira, with more than half the total number of producers and 72 percent of dairy herd, dominate dairy production on the Azores (Table 1).

Most processing activities are also concentrated on these two major islands (Table 2). The large dairy firms produce mainly milk powder and cheese destined for the mainland market. During the low production season, continental dairy processors rely heavily on the powdered milk from the Azores which is then reconstituted and sold as liquid milk or converted to cheese and butter. Little raw milk moves between islands, and on those islands of lesser production, smaller specialized firms transform milk to cheese and butter. The Sao Jorge cheese (cheddar type) has gained some recognition as a specialized product and has a small market in the United States.

The attraction of milk production lies in the islands' natural climatic advantage with regard to pasture-based dairying. About 68 percent of arable land is devoted to permanent pasture, and government programs have offered incentives to increase pasture area. The climate is characterized by high levels of well-distributed rainfall, high relative humidity, and moderate temperatures. On most islands, altitude varies from sea level to about 1000 meters, and the quality of pasture grasses varies according to the season. This pattern encourages a seasonal transhumance in which the cattle graze up the mountainsides during the summer months, then move down into the lower (less than 300 meters) altitudes during the winter. Excess grass production during the spring and summer is stored as either hay or silage, and some farmers sow corn for silage in lower altitudes.

Although closely managed, dairy cows spend their total time in fields. Only rarely do farmers provide any type of shelter against the rain, but most pastures are protected from the wind by rows of Cryptomeria japonica, which also has value as timber. Some dairymen control feeding by marking off

Table 1: Characteristics of Raw Milk Production in the Azores Islands (1980)<sup>a</sup>

Island	Number of Producers	Number of Cows	Milk Received by Processors('000 liters)
Sao Miguel	4,436	36,231	120,936
Terceira	2,554	19,207	37,946
Graciosa	478	957	655
São Jorge	1,365	6,169	11,651
Pico	1,734	5,208	2,668
Faial	1,417	5,424	6,296
Flores	736	2,275	1,488
TOTAL	12,720	75,471	181,640

Source: Direcção Regional dos Serviços Veterinários

<sup>a</sup> Does not include the Islands of Corvo and Sta. Maria because of their insignificant number of producers.

**Table 2: Major Processed Dairy Products on the Azores Islands (1982)**

Island	Milk Received ('000 liters)	Raw	Liquid Milk Pasteurized ('000 liters)	UHT	Butter -----	Cheese Metric	Milk Powder Tons -----
São Miguel	129,751	1,067	7,389	2,819	1,402	4,177	8,043
Terceira	42,313	---	3,698	10,250	708	350	2,744
Graciosa	558	28	---	---	---	52	---
São Jorge	12,353	15	---	---	---	1,060	---
Pico	3,215	141	---	---	10	256	---
Faial	7,778	746	---	---	83	577	---
Flores	1,950	45	---	---	4	160	---
TOTAL	197,918	2,042	11,086	13,069	2,207	6,632	10,787

Source: Direcção Regional dos Serviços Veterinários

pasture areas with temporary electric fencing; others actually tether their animals in equal spacing across the pasture area. In the latter case, preferential feeding can be given to the better cows by simply extending their tether lines or by putting them in the better sections of pasture. Most animals are milked by hand twice daily. At milking time, the cows receive a relatively small portion of mixed feeds, about one to two kilos.

Virtually all dairy cattle on the Azores derive from Holstein and Frisians breeds, and productivity per cow is high relative to the mainland. An important market for calves also operates on the islands. Most calves are shipped live to fattening yards on the continent, and in 1982 over 48,000 live animals as well as over 4000 tons of beef carcass were sent to the mainland market. Some officials argue that poorer pastures or specialized islands (for example, Picos) could be used for fattening of calves, instead of exporting this important source of value-added.

From the perspective of individual farmers, the dairy "revolution", as it might be called, has opened up new economic opportunities. The existence of somewhat curious land market institutions and the availability of subsidized agricultural credit has made dairying a feasible economic activity for a large segment of the population, including the part-time farmer. Usufruct rights to land can be obtained with the purchase of a cow (about 5576 m<sup>2</sup> per cow); an active custom work market facilitates pasture installation and maintenance; and a pasture-based system has few major manpower bottlenecks. All these factors create a "low overhead" dairying operation accessible to many who are not professional farmers. On the other hand, the same incentives encourage larger farmers to improve their herds and expand their farms, and these compare favorably with any in the United States and Europe in terms of technological sophistication.

### **Dairy Policy In the Azores**

The insular position of the Azores, a region separated from the mainland by nearly a thousand miles of ocean, dominates its economy and its policies. Island economies must trade to survive: the local market is far too small for the production of a wide variety of goods. Trade is predominantly with continental Portugal, though also with North America, other western European countries, and with other Portuguese-speaking areas. Specialization goes hand-in-hand with a high dependence on trade, and in this case, the Azores specialize in livestock products from the dairy herd. Although the islands can lay claim to a natural production advantage, such specialization can engender vulnerability to world market conditions. The international market for dairy products, for instance, has been depressed for a number of years, reflecting the desire by industrial countries to remove surplus dairy production from domestic markets. If the Azores were to attempt to make a living by selling dairy products onto the world market, the economy of the islands would rise and fall with the success or failure of (say) the European Community to control milk output. Similarly, the market for beef cattle or for dairy calves would fluctuate over time in accord with the cyclical patterns of the major producing countries.

Portuguese and Azorean policy, thus, acts to prevent such instability in a small open economy. The dairy sector is given preferential access into the protected Portuguese mainland market: it is 'within' the Portuguese market as defined by scope of policy. Imports from other countries are allowed into Portugal (under the control of trade exercised by the JNPP) only if both mainland and Azores production falls short of requirements. This preferred access does not entirely remove the problem of instability, but changes its nature. The demand for Azorean dairy products fluctuates with the state of

the mainland market rather than with world prices. Azorean production becomes 'residual' in the sense of complementing continental production. Accordingly, policies and production trends on the mainland dictate the state of Azorean industry.

Dairy policy on the mainland protects both mainland producers and consumers. It is geared toward the adequate provision of liquid milk (in the form of pasteurized or UHT milk) and milk products (particularly cheese) to urban consumers at low prices. Production in most of the country is channeled through local cooperatives and their unions. These unions provide distribution outlets as well as processing facilities, in conjunction with a small private sector.<sup>1</sup> Cooperatives enjoy exclusive collection rights and, through the network of collective milking parlors and collection points, provide a range of services to small farmers. The individual dairies decide on the disposition of the milk, taking into account market needs and the quality of the raw milk itself. Prices for milk products are effectively controlled through a guaranteed price for raw milk and fixed margins for collection, processing, and marketing.

Policy in the Azores has some of these same features and some important differences. The farmer receives a fixed price for milk, based on butterfat content and milk quality. The producer price set by the Azorean authorities is below that received by mainland farmers, by a margin that reflects transport costs to the mainland. There are no collective milking parlors, and the farmer can sell his milk to one of several private firms or cooperatives. He delivers his milk to a collection point, operated by the dairy, and no fixed collection margin is paid. The dairy processes the milk into powder or cheese for transportation to external markets, and processing margins are agreed between firms and Azorean authorities. The government provides a consumer subsidy on liquid milk produced for Azorean consumers and for the small

amounts of UHT milk shipped to the mainland. Furthermore, the JNPP purchases and stores excess milk powder during seasons of peak production, and eventually sells it to mainland processors. A subsidy is paid to dairies on the mainland which reconstitute Azorean milk powder both for liquid milk (during low milk production periods) and for processed dairy products. Thus, both lower producer prices and government intervention policies serve to make Azorean milk powder attractive to mainland firms.

These dairy policies follow a cautious line that characterizes wider relations between the Azores and mainland Portugal. Certainly the Azoreans perceive no advantage in total market autonomy, but as surely seek to protect the positions of their producers and processors. The following evaluation of dairy sector policies offers insights into the basic economic strengths and weaknesses of the Azorean dairy industry and will discuss issues that highlight Azorean--mainland relationships both now and under the scenario of EC membership for Portugal.

### **Method and Data Collection**

The study employs social profitability analysis to evaluate both the competitiveness and efficiency of Azorean dairy systems. The methodology also identifies the major effects of policy upon profitability (see PES 1982 Report, Chapter 3). A system is defined as a complex of activities beginning with the farm-level and including farm to processing, processing, processing to market. Each activity within the system is analyzed in an accounting framework to determine profitability first at market prices (i.e., private competitiveness) and then at social prices (i.e., economic efficiency). The difference between profitability at market prices and social prices represents the net effect of policy upon any given system. For example, if a system demonstrates strong private profitability but negative social profitability,

the analysis suggests that government policies rather than inherent economic efficiency are responsible for maintaining the continued viability of this system. The methodology also allows a breakdown of government policies into component effects upon outputs, upon tradable inputs, and upon the domestic factors.

As the initial step, representative activities were selected for analysis. With due attention to the great intraregional variability, a typical farm was identified as a numerically predominant type of activity, yet neither the most advanced nor the most rustic. Some partial budgeting techniques can later expand the analysis to include the effects of increasing herd size or of introducing certain innovations, but presently only a single activity type was analyzed. Similarly for processing activities, the larger dairies rather than the small specialized firms were considered representative. The final destination of all these commodities was Lisbon.

The analysis examines three systems: flamenco-type (edam) cheese, full-fat milk powder, and skimmed milk powder. Since, all three assume raw milk from a single representative farm activity, only the processing activities and transportation costs vary. On the basis of interviews with farmers and technicians, both the technical coefficients and the private costs of the representative farm were estimated and incorporated into the accounting framework. In a similar fashion, dairy processors were interviewed and representative budgets constructed.<sup>2</sup> Estimated shipping costs provided by the government maritime monopoly were also used. After defining the activities of the respective systems at private (market) costs, relevant policies affecting the production, processing, and transportation of dairy products were identified. These policies include not only direct intervention in the system, but also such indirect actions as national credit policies and tariff controls.

Social costs of these systems were estimated using world prices for outputs and tradable inputs. Shadow pricing techniques employed in the 1982 PES Report were used to estimate social costs of land, labor, and capital. Three general questions are addressed. Were the basic dairy systems of the Azores profitable in 1982? Do these systems efficiently allocate scarce economic resources; that is, do the Azores enjoy any advantage in the production of these dairy commodities, or would Azorean resources be better employed (in an economic sense) in the purchase of these commodities on a world market? What role does government policy play in either subsidizing or taxing dairy production on the Azores? Finally, the analysis incorporates changes in profitability resulting from accession to the European Community and the concomitant adoption of the Common Agricultural Policy, thus giving Azorean policy-makers a projection of possible effects of integration.

## DESCRIPTION OF SELECTED SYSTEMS

In this section, we describe first the activities, at the farm and post-farm level, and then conclude by identifying the systems made up of production, transport to the dairy, processing, and transport to the market. Although the private profitability of individual activities can be examined independently, social profitability makes sense only in the context of the full set of activities in the chain. Empirical estimates of both private and social profitability are given later in the report.

### Farming activities

Azorean dairymen enjoy some of the most favorable natural conditions for milk production found anywhere in the world. Their islands are lush in pastures that with adequate management can support high quality cattle herds year round. Marked variations in technology exist, particularly with regard to pasture management and pasture conservation. Farms also vary in size; however, even on the larger operations, herds tend to be nucleated into groups of about 40 cows, apparently the optimum herd size that two laborers can manage in an open pasture situation.

The representative dairy farm selected for analysis has twenty cows on 80 alqueires of land (in Sao Miguel, 11.15 hectares). More than 80 percent of the farms in the Azores have an average herd size of less than 20 cows, an adequate quantity for full-time specialized activity. The analysis assumes that this farm can be operated by the farm family itself without the need for off-farm labor. Although pasture installation and management as well as silage and hay-making activities entail an extensive use of machinery, the typical farm relies exclusively on the custom machine operators readily available throughout the major islands. The need for machines such as forage

choppers and hay balers and for such equipment as plows, fertilizer spreaders, and mowers is so limited throughout the year that farmers find the prevalence of custom operators a significant convenience. Of course, custom work largely restricts farm labor needs to herd management and milk transport.

As on many agriculturally-based islands, land is scarce on the Azores. Despite a highly uneven distribution of land ownership, there is relatively easy access to land through an active rental market. Legal maximums control, at least theoretically, land rent levels, but many owners are non-farmers who prefer to rent rather than cultivate their holdings. The current "dairying fever" however, has increased land values levels to above the controlled rates. As a result, land commonly changes hands between renters who charge each other a premium for usufruct rights. This premium is embodied in the cattle which are concurrently negotiated. Thus, a farmer can sell cattle "with or without land", and a cow with land demands a price of up to 100 percent more than cow sold without. Often diseased or cull cattle are dispatched in this fashion, but the significant component of the transaction is, indeed, not the animal but the land (four alqueires) that goes with it. Although the landowner does retain a right of veto over the transfer of the contract, the market seems to operate with great efficiency.

This pasture-based dairy farm uses land located at varying altitudes. This type of transhumant management assumes half the farm--above 300 meters--is used essentially for the summer pastures, and half the land--below the 300 meter mark--constitutes the wintering area. Excessive grass production in the spring and summer pastures is stored as hay to supplement the lower quality of winter grasses. Generally, permanent pastures are sown with a mixture of ryegrass (*Lolium*, sp.) and a legume, normally clover. Under conditions of poor management, the pastures can easily suffer the invasion of native, less nutri-

tious grasses. The analysis assumes an average ten-year life and annual maintenance for permanent pastures, although many produce adequately for two or three decades.

With the exception of mixed rations, food is never transported to the animals. The cows spend their lives in the pasture areas, moving through the seasonal cycle of transhumance. The scarcity of running water on the islands does create a problem. Farmers either build catchment areas to harvest rainfall within the pasture or transport tank wagons with automatic valves to where the herd is grazing. All milking is also done by hand in the pasture. One interesting innovation for larger herds has been the mobile milking machine operated on tractor power take-off. Although the machine saves labor and permits larger herd units, farmers have not yet perfected its use, and some technicians (and farmers) argue that machine milking has resulted in a high incidence of mastitis on the islands. Milk goes in fifty liter cans to the collection posts of the major dairies on the islands. The production of a twenty-cow herd requires at least a horse and cart, the common form of farm transportation.

The representative dairy farm produces an average of 4000 liters of milk per cow per year. With on-farm herd replacement and an 80 percent calving rate, 16 calves are produced each year. Thus, twelve calves and four cull

### Post-farm activities

Milk in the Azores is typically delivered by the farmer to a collection point owned by the dairy. From there, the processing firm transports the milk--usually in a bulk tank truck--to the plant. Depending upon the quality of the milk and the market for various products, the firm will direct the raw milk into the production of liquid milk for retail distribution (either as pasteurized milk or UHT), dried milk, or cheese. If, in any of these processes, butterfat is removed, it can either be added back into other products or used to produce butter.

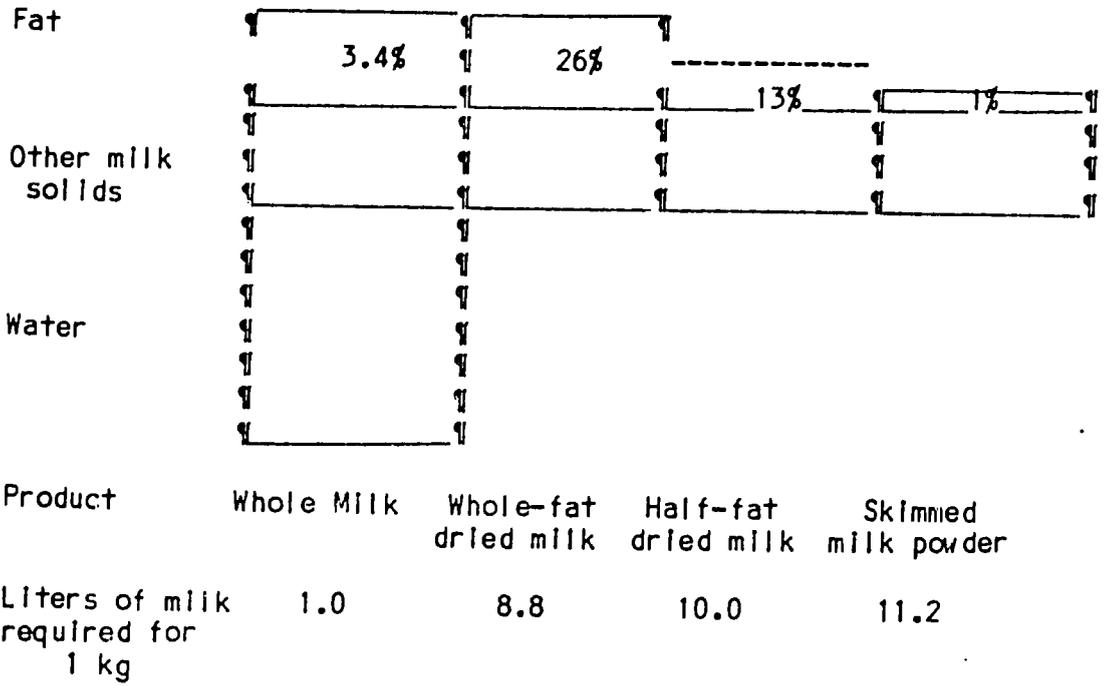
Since the major market is almost one thousand miles away, the product choice is dominated by transport cost considerations. Reducing the water content of the milk product and eliminating the need for refrigeration are the main objectives. In addition, Portuguese policy as applied on the mainland also directly affects the profitability of the various products. These considerations militate against production of liquid milk other than for Azorean use (including sales to the foreign bases located on the islands). Thus, the two processing activities which are most interesting to study are those that either dry or curdle the milk before exporting it to continental Portugal.

The drying process involves spraying milk under pressure into a heated chamber, allowing the powder to collect at the bottom and be removed and bagged. The main choice is how much of the butterfat to remove before drying. This choice can be illustrated by Figure 1. Whole-fat milk powder is made by drying the milk without the removal of any significant amount of butterfat. One kilogram of this product requires about 8.8 liters of milk at 3.4 percent butterfat content. The milk powder itself will have a 26 percent fat content after the water has been removed. It is commonly reconstituted by mixing

water at a 10:1 ratio; the result is liquid milk at 2.6 percent butterfat. This reconstituted milk can be used for the manufacture of cheese on the mainland. The manufacture of full-fat powder has no by-product. By contrast skimmed milk powder has virtually all of the cream butterfat removed which can then be used in the making of butter. As a consequence, it takes more milk (11.2 liters) to make a kilogram of skimmed milk powder. The fat content of this product is usually between 0.5 and 1.0 percent. When water is added (at a 10:1 ratio) the skimmed milk has about 0.05 percent fat and is either recombined with added cream or is used in the animal feed industries as a source of protein. Intermediate between whole-fat and skimmed milk powder is half-fat milk powder, which uses about 10 liters of milk and contains 13 percent butterfat. When reconstituted, it becomes liquid milk with a 1.3 percent fat content and is either sold as low-fat milk for speciality products or used elsewhere in the food industry. Alternative production decisions depend upon both the value of butterfat (i.e. the cream) and the amount of extra milk needed to produce the lower-fat powders.

The main alternative to milk powder is the production of cheese. One kilogram of cheese requires 10-11 litres of milk (depending upon the type of cheese). Whole-fat milk is used, and indeed butterfat is sometimes added to the milk before it is curdled. The process of curdling involves the introduction of rennets and other agents which accelerate the solidification of the curd, leaving a watery whey. The whey can be either fed to animals directly or dried in a process similar to that for milk, in which case, it also is used as animal feed. The curd is cut into shapes, compressed, and allowed to dry in a cold chamber. When dried and packaged, the cheese has a fat content of up to 45 percent.

Figure 1: Composition of Alternative Dairy Products Produced In the Azores



## PROFITABILITY OF DAIRY SYSTEMS

Private profitability determines the ability of a chain of firms to meet competition and stay in business taking into account their actual revenues and costs. One can also ask, however, whether the system as a whole shows profit at social prices, i.e. at the true cost to society of factors, at the foreign exchange cost of imported inputs, and at world market prices for outputs. This social profitability determines whether resources are efficiently used in the process, and hence, whether the country has a comparative advantage in the production of those commodities.

Private profitability for the system can be broken into the profits (or losses) at each stage of activity. In the present study, a separate costing was not made for the transportation of milk to the dairy plant. The cost figures provided by the dairy plants for the collection of milk were used. As a consequence, no "profit" was recorded for this activity: the difference between the price received for milk by the farmer and the price "charged" at the dairy factory as the delivered cost of milk was taken to be equal to the collection cost. Any actual profits made on the collection activity would, therefore, be ascribed to the processing activity. Nor were independent estimates made for the cost of transporting the product to Lisbon: any profit actually made by CGT, the shipping concern, is not identified in this study.

Social profits cannot meaningfully be allocated to the individual activities. Each activity incurs social costs, as reflected in the cost of inputs and factors. But the output, to be evaluated in social terms, must be sold on a market where alternative sources of supply are available or where foreign exchange is earned. Thus, milk at the farm level does not have a social value independent of the implied value as a raw material for a traded product.<sup>3</sup>

Indeed, social profits for the system do not necessarily accrue to the system itself: they represent the benefit to the society of using resources in that particular production system.

Where private and social profits differ, the implication is that private and social costs, for output, inputs, or factors, also differ. The main reason for such a difference is the effect of policy--both within and outside the dairy sector.<sup>4</sup> For example, a tax on imports raises the private cost above the social cost (as measured by the actual foreign exchange outlay). A subsidy on fertilizer, by contrast, lowers private costs relative to social costs, since "society" as a whole pays the full cost of fertilizer, even if the farmer pays a lower price. These "policy effects" are discussed after the analysis of private and social profits.

### **Private Profits and Private Profitability**

The private profitability calculations strongly support initial impressions regarding the attractiveness of milk production on the Azores. The Azorean dairy industry shows considerable profits in all system activities. Even with allowances for margin of error in cost estimates, both farmers and processors enjoy high returns to investment in dairy products (Table 3). When compared in terms of escudo costs per liter of raw milk, farm expenses are concentrated in labor and input categories. Labor costs reflect basic labor intensiveness in pasturing small cattle herds and manual milking, while the custom machinery services keep capital costs at a minimal level by avoiding excess machine capacity. Input costs predominantly involve outlays in fertilizers for pasture installation and maintenance. At a profit of 4.22 escudos per liter, a representative farm can realize an income of about 3,000 dollars annually, a significant amount when compared to other agricultural activities both on the islands and the mainland.

Table 3. Private Costs, Returns and Profit of Azorean Dairy Activities.

Activity	Land	Labor	Capital	Inputs	Output	Profit
	-----escudos per liter of raw milk-----					
Farm	1.87	4.97	0.81	5.42	17.29	4.22
Processing						
Cheese	0	2.87	2.58	15.97	30.42	9.00
Skimmed Powder	0	2.30	2.54	15.60	28.95	8.51
Full-fat Powder	0	2.71	3.01	15.58	27.91	6.61

a) For processing, inputs include costs of raw milk

Processing profits per liter of raw milk are significantly higher than farm profits. The results of the analysis suggest that under current market conditions, cheese represents the most profitable alternative use of the raw material, probably because of the relatively low value attributed to butter-fat and, consequently, to butter as a by-product of skimmed or half-fat milk powders. The cost structure of processing relative to the farm activities change in that capital expenses increase significantly. The tradable input category is comprised almost entirely of the cost of raw milk with a residual reflecting the costs of packaging and other materials.

Private profitability can also be examined at a system level. Obviously with all activities showing significant profits, the different dairy systems present similar cumulative results (Table 4). System profitability--profits divided by per unit value of output--ranges from 35 to 40 percent. Again, cheese is the most lucrative of the alternative dairy products. The distribution of system profitability between activities reveals that processing captures around two-thirds of system profits. As a percentage of value-added, processing profitability is double that of the farm. These measures are corroborated by the active expansion of the processing plants observed in the Azores.

### **Social profitability**

The aim of evaluating social profitability is to show which systems are "paying their way" at social prices for factors and inputs and at the social valuation of their tradable outputs. This stern test implies, in effect, the removal of all subsidies (and taxes): if a system shows profits when competing at world prices (i.e. if the value added at world prices is greater than the social cost of factors), then the country can claim a comparative advantage in that product. Measuring social profits adds another dimension of

**Table 4: Private Profitability of Three Azorean Dairy Systems, 1982**

System	Farm Level	Processor Level	Total System
a) Escudos per kg of final product			
Full-fat milk powder	36.60	58.03	94.63
Skimmed milk powder	46.89	94.67	141.56
Cheese	42.58	89.98	132.56
b) Percentage of systems profit			
Full-fat milk powder	38.7	61.3	100.0
Skimmed milk powder	33.1	66.9	100.0
Cheese	32.1	67.9	100.0
c) Percentage of value added <sup>a</sup>			
Full-fat milk powder	35.5	62.3	44.8
Skimmed milk powder	35.5	73.0	50.5
Cheese	35.5	70.3	50.2
d) Percentage of total output			
Full-fat milk powder	24.4	24.2	34.7
Skimmed milk powder	24.4	29.2	39.7
Cheese	24.4	30.0	39.5

<sup>a</sup>Value added equals sales less purchased inputs and raw materials. It represents return to land, labor, and capital used in the activity.

difficulty to an empirical study. Not only are world prices volatile and quality comparisons sometimes difficult to make, but the social cost of domestic factors can only be deduced rather than observed. In the estimates given here, social and private costs and revenues differed principally in the following ways:

- (i) specific subsidies, in particular on fertilizer and mixed feed, which reduced the private cost of inputs;
- (ii) the customary 14 pay months per year, which increased the private cost of labor above its social cost;
- (iii) the rate of interest on borrowing, estimated at 6 percentage points below the real cost of capital to the economy;<sup>5</sup>
- (iv) a tariff averaging five percent on imported capital equipment, implying a higher private than social cost for these items;
- (v) world prices (c.i.f. Lisbon) for the three products, which differed considerably from the prices actually received on the Lisbon market for Azorean exports;<sup>6</sup> and
- (vi) a zero social cost on land use in the Azores, implying, at least at the margin, that no alternative revenue-earning use exists.

The results of the analysis of social profitability are summarized in Table 5. It will be recalled that only system profitability is meaningful in this case as the distribution of those profits among activities would be arbitrary. A number of measures of profitability for the three systems are shown and each tells a similar story. Cheese emerges as the only product to be socially profitable. The excess of social value of output over social cost of inputs and factors is 50 escudos per kilo, or 20 percent of the social value. This represents a social return of 30.2 percent of value-added in

social prices and of 43.3 percent of factor costs as social prices. Both skimmed milk powder and full-fat milk powder show social losses. The domestic resource cost ratio (DRC), also shown in Table 5, is a measure of the social factor cost to obtain one unit value-added at world (social) prices: If the DRC exceeds unity, a greater value of factors are employed to produce the commodity than the difference between the cost of the product and the cost of the material (tradable) inputs. For full-fat powder and skimmed milk powder, domestic resources cost five and 17 percent more, respectively, than the world market determination of the value of undertaking the production of those commodities. For cheese, the same ratio shows that domestic factor costs are only 70 percent of such a world-market-determined value. The Azores appear to have a comparative advantage in the production of cheese, but not of the other two products.<sup>7</sup>

As indicated above, the use of world prices greatly influences these calculations. Milk powder prices are often kept low by the action of other countries who wish to dispose of surplus dairy stocks. Though that does not invalidate the comparison, since even a chronically depressed world price determines the amount of foreign exchange needed to purchase the good, it does mean that a country might consider a product to be efficiently produced even if in some years it would be cheaper to buy on world markets. The last column of the table shows the level of world price at which there would be no social profits or losses. In the case of skimmed milk powder, the world price would have to be 123 escudos per kilogram (an increase of 16 percent) for the Azores to have a comparative advantage. An increase of only four percent in world market prices would make full-fat milk powder profitable, while cheese would be profitable even with a 26 percent fall in world market price.<sup>8</sup> As will be discussed below, one of the most important consequences of joining the European Community is to alter the access a country has to world markets. Imports

**Table 5. Social Profitability of Azorean Dairy Systems, 1982**

System	Social profit per kg of final product	% of social value of product	Domestic resource cost ratio	Breakeven world price (esc. per kg)
Full-fat milk powder	-5.41	-3.18	1.05	149.4
Skimmed milk powder	-17.69	-9.28	1.17	123.0
Cheese	50.34	20.48	0.70	149.7

have to be purchased, in effect, at internal EC prices, since levy and duty receipts are paid over to the EC on goods emanating from outside the Community. Thus, if EC prices are above the "break-even" world prices shown in the table, then these commodities may in the future be efficiently produced in the Azores.

### **The Effects of Policies on the Dairy System**

The differences between private and social costs and values represent the impact of policies, both within and outside the dairy sector. With private and social profits calculated, it becomes straightforward to isolate these "policy effects."<sup>9</sup> These policy effects can be broken down into those that operate at the level of output prices, those that impinge upon input markets, and those that result from difference between social and private factor costs. Since social valuations are only meaningful at the system level, policy effects can only be identified for systems and not activities. Table 6 gives the policy effects for the three dairy systems.

As might be expected, the primary policy effect is the assurance of markets in Portugal for Azorean milk powder and cheese at prices above those which exist in world markets. This price support effect is largest for skimmed milk powder, at over 165 escudos per kilogram. To the Azorean administration, this does not represent a distortion in economic incentives, since there would be no point in paying dairy processors the world market price if the actual market returns in Lisbon are substantially higher. The "policy effect" in this case is the effect of Portuguese dairy policy, the restriction on imports from the world market, rather than of Azorean policy. The costs of such a policy, encouraging production of dairy goods by pricing them above world market levels, has to be viewed in the context of Portuguese agriculture as a whole. As discussed later, this whole context is overshadowed by imminent EC

**Table 6. Policy Effects on Three Azorean Dairy Systems**

a) distribution of policy effects (Esc. per kilo)

	output price	input price	factor price	total
Full-fat milk powder	102.58	7.93	-10.46	100.05
Skimmed milk powder	165.73	9.86	-16.34	159.25
Cheese	90.00	7.74	-15.53	82.22

b) overall measures of policy effect (%)

	nominal protection	effective protection	producer subsidy equivalent
Full-fat milk powder	60	110	37
Skimmed milk powder	87	168	45
Cheese	37	59	24

accession: But the magnitude of the price-policy effect is of interest in the general question of Azorean mainland economic relationships.

The net effect of material inputs on these systems is to reduce their cost below that which would obtain in the absence of policy. This net subsidy varies from 7.7 escudos per kilogram of cheese to 9.9 escudos per kilogram of skimmed milk powder. Once again, the main policies causing this effect are those of the mainland--the mixed-feed and fertilizer subsidies, offset in part by tariffs on imported capital equipment. Depending upon how much of the subsidy is paid directly from Azorean tax funds, these transfers again are not necessarily a distortion of incentives from the point of view of the RAA.<sup>10</sup> Factor price "policies" have the opposite effect--of representing a net tax on the systems. Private land and labor costs are higher than social costs, but private capital costs are less. The net effect outweighs the subsidy granted on tradable inputs by a small margin. Thus, overall policy impacts are a little smaller than indicated by the output price policy effect alone.

The second part of Table 6 uses some common measures of policy effects which can be compared across systems and indeed across sectors in the economy. The nominal rate of protection is the ratio of private price to world price for the output of the system. At 87 percent, the skimmed milk powder protection is highest, reflecting the largest proportional gap between prices received and those ruling on world markets in 1982. Protection for cheese is a more modest 37 percent. The effective protection measure reflects the ratio of value added at domestic prices to that at world prices. It gives a picture of incentives from policies affecting products--but not factors--within an economy. Within the dairy sector, the implication is that milk powder, in particular skimmed milk powder, is a favored system which can entice resource from cheese production. The final measure, the producer subsidy equivalent,

Indicates the percentage subsidy which would be needed to compensate for the removal of all policies. Thus, in the case of skimmed milk powder, a 45 percent output subsidy would substitute for the range of policy impacts on that system: the corresponding number for cheese is 24 percent.

#### FUTURE PROFITABILITY OF AZOREAN DAIRY SYSTEMS

In June, 1983, the government drastically reduced agricultural subsidies in order to address serious macroeconomic problems, particularly Portuguese budget deficits. Subsequently, producer prices were adjusted upward to compensate for increased input costs. These changes will have significant impacts on dairy systems on the continent and in the Azores. The second column of Table 7 indicates the effect of these changes on the profits of Azorean dairy systems. These numbers were calculated by incorporating the price and subsidy changes into the 1982 budgets. On the output side, the real (1982) price of cheese increased slightly, and the prices of the two types of milk powder decreased in real terms. Of more importance was the increase in input costs due to elimination of the subsidies on mixed feed and fertilizer. The latter item represents 22 percent of the private cost of production of raw milk. The net effect of the price and subsidy changes is to reduce the profitability of all three of the Azorean dairy systems. However, they all remain significantly positive, so that full-fat milk powder, which has the greatest reduction, still shows a 22 percent profit on returns. On the basis of economic efficiency, the price changes are in the right direction, since they move private profits closer to their social levels, but they still maintain positive private profits for the socially unprofitable milk powders.

Table 7. Projections of Private and Social Profits In Azorean Dairy Systems  
(1982 Escudos Per Kilo of Product)

	1982	1983	1986	1990	1995
<b>Private Profit</b>					
Cheese	128.4	108.0	61.5	16.1	7.5
FFMP	91.5	58.1	57.2	-31.7	-65.4
SMP	138.4	112.9	111.7	21.2	-13.2
<b>Social Profit</b>					
Cheese	50.3	50.3	99.2	53.8	40.3
FFMP	-5.4	-5.4	85.1	-3.8	-37.5
SMP	-17.7	-17.7	115.6	25.1	-9.3
<b>Value of output of main product - private prices</b>					
Cheese	290.0	295.3	250.4	202.9	189.0
FFMP	245.8	234.4	234.9	144.2	170.2
SMP	237.1	239.9	240.3	147.5	112.7
<b>Cost of tradable inputs at private prices</b>					
Cheese	71.6	97.3	98.8	96.8	96.4
FFMP	61.4	83.6	84.9	83.1	82.8
SMP	76.2	104.5	106.2	103.9	103.5
<b>Value of output of main product - social prices</b>					
Cheese	200.0	200.0	250.4	202.9	189.0
FFMP	143.0	143.0	234.9	144.2	110.2
SMP	105.3	105.3	240.3	147.5	112.7
<b>Cost of tradable inputs at social prices</b>					
Cheese	79.3	79.3	80.8	78.7	78.4
FFMP	69.3	69.3	70.6	68.8	68.5
SMP	86.1	86.1	87.7	85.5	85.1

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### **Profitability Under the Common Agricultural Policy**

Portugal seems destined finally to enter the European Community, if the final stages of negotiations proceed smoothly, in about 1986. Perhaps the major visible implication from an economic point of view will be the adoption of the Common Agricultural Policy. CAP dairy policy relies heavily upon the support of milk products, specifically butter and skimmed milk powder, to maintain a price to the producer for raw milk. The fixed price regime currently practiced in the Azores will be replaced by a 'target' price for raw milk. Whether actual farm prices are below or above this target depends on the profitability for milk products. Intervention in the butter and milk powder markets in the Azores could well lead to a higher farm price. If intervention takes place only on the mainland, the price prospects look less attractive to farmers. In addition, milk products from other EC members will be able to compete fully in Portugal (and, indeed, in the Azores) after accession. The price of these products is again related to CAP policy prices.

The Common Agricultural Policy will have to be introduced gradually, both with regard to the institutional changes needed to administer it and to the price level changes which are implied. For some sectors, there is likely to be an extended period prior to the harmonization of prices when the market institutions can be modified to facilitate policy implementation. For other commodities, the normal transition steps will proceed from the point of accession. It appears that the dairy sector will fall into the latter category. The major changes that will be required involve the modification of price levels. The mechanism for applying levies on imported dairy products and for purchasing surplus domestic production can be put in place with relative ease. Thus, in what follows, the emphasis will be placed on price changes rather than market institutions.

The present EC dairy policy relies heavily upon price support through the compulsory purchase by state agencies of milk products. Imported milk products are discouraged from entering the Community by high levies, and exports are facilitated by substantial subsidies. Butter and skimmed milk powder are the products purchased by intervention agencies throughout the Community, with Italy enjoying the ability to further support the dairy market through the purchase of certain types of cheese. Intervention takes place naturally in the surplus production regions. The high prices set for dairy products, ostensibly to provide adequate incomes for small farmers in various parts of Europe, have encouraged a rapid expansion of dairy production, in particular from sizable modern farms in some of the more favored agricultural areas. The dairy policy is under pressure, and it is likely that the next few years will see reduced incentives for additional milk production in the Community.

Portuguese dairy policy will have to be adapted in a number of ways to meet the requirements of membership. First, the guaranteed producer price for raw milk will have to give way to a price reflecting the value of the milk products to the dairy. Thus while dairies may well continue to pay a uniform price to farmers for milk of a particular quality. There is no guarantee that this price will equal the target price for liquid milk announced for the Community. Under the present situation, Community farm prices for milk vary substantially across countries. Secondly, the exclusive collection rights of dairies in the organized zones on the mainland may be challenged as being inconsistent with EC laws of competition. This change will have less effect in the Azores, where the farmer may presently sell to any dairy firm of his choice. It may, however, influence the 'rationalization' of collection facilities which has been proposed to speed up delivery to the factories. Thirdly,

the relative price of butter and milk powder will change following entry into the EC. The present EC price for butter is some 40 percent higher than in Portugal, and the skimmed milk powder is only one half of that on the Portuguese market.

The effects of changes in the dairy product prices on private and social profitability are summarized in Table 7. The following assumptions were used to generate these projected results. First, Portugal is assumed to join the Community in January, 1986, and that there will be a ten-year transition period over which Portuguese prices are harmonized to EC levels in equal steps. The general method of projecting EC prices is described in the PES 1982 Report. For each member country there is a range of feasible price changes, given the country's inflation rate, currency movement relative to the ECU, and given the general constraint that no country will allow nominal price decreases. The intersection of each member's feasible range of price changes defines the possible range for the Community. Several rules were suggested to trace price paths over time within this feasible range. In the 1982 Report, the highest possible price change consistent with no real price increase in any member country (MINMAX) was chosen as the rule that most closely described previous price decisions in the Community. However, in the light of current budgetary problems facing the EC, caused in large part by surpluses of dairy products, a tougher price policy for dairy products seems likely, at least for a period of time. Therefore, for the first five years of transition, a more restrained price rule (MAXMIN), stipulating that prices will increase only enough to ensure no nominal decrease for any member. After this period, the MINMAX rule is applied. The analysis also generates green exchange rates used to translate CAP policy into escudos, based on the assumption that Portugal abides by the Gentleman's Agreement, as described in the 1982 Report.

Secondly, It is assumed that the market prices for skimmed milk powder and butter are at the intervention level in the Azores after membership, since the islands are a surplus area, and therefore will likely have an intervention center. Full-fat milk powder prices are assumed to change by the same percentage as skimmed milk powder, maintaining a constant ratio between the two. Cheese prices rise to the threshold level as a result of protection from third country competition. The Azores are surplus producers of cheese, but if there is no intervention program for Portuguese cheese, Azorean producers must bear the cost of transportation to continental markets. It should be noted that the threshold price for cheddar cheese is 12 percent higher than that of Edam-type (whole cheese of 45 percent butterfat), used in the calculations. Under the CAP, Ilha cheese (cheddar type) may command a premium because of the higher threshold price for cheddar.

Private profitability for all three systems decreases upon membership in 1986 and continues to fall thereafter. By 1995, both milk powder systems are unprofitable, although cheese is still slightly profitable. This fall in private profitability is the result of changes in output prices and input costs due to CAP policies, and therefore reflect the assumptions about CAP price decisions, transition arrangements, and green rate policies. The output price effects are quantitatively much more important. The changes in output costs reflect changes in the price of mixed feed due to the effect of the CAP on cereal prices. These changes are quite small, and by 1990 tradable input costs, which include mixed feed, are slightly below their 1983 levels.

After accession, the social value of the outputs becomes equal to the private value, because after membership the opportunity cost of dairy products becomes the European price and Portugal must pay over to Brussels the difference between the European price and the world CIF price on imports. In turn,

Portugal receives from export Brussels refunds equalling the difference between the EC price and the world FOB price. Thus, to Portugal as a member of the EC, the foreign exchange cost of imports and receipts for exports equals the EC price rather than the world price. The social cost of inputs that are CAP products becomes equal to the private (EC) costs for the same reason. These changes in the definition of social costs and returns after 1986 explain the large changes in those values at that date.

The difference between private and social profit is the net effect of policies on the system. After 1986, this difference is due only to Common Customs Tariffs on imported inputs and domestic policies affecting the costs of land, labor, and capital, since the private and social values of outputs are equal. Social profits jump in 1986 because of the change in the social value of the output. However, social profits fall as the social value of the outputs decreases, until in 1995 only cheese is socially profitable.

## CONCLUSIONS

The examination of the private and social profitability of dairy systems in the Azores suggests that currently the Azores enjoy a comparative advantage in cheese production, even taking into account transportation costs. Milk powder production is currently slightly unprofitable in social terms, but this may be due to a short-term depression in world market prices following from trade policies of other countries. Current Portuguese policies offer substantial subsidies to all of these systems, so that even milk powder production is privately profitable. Recent policy changes have reduced the difference between private and social profits.

With the introduction of CAP policies, all three activities become socially profitable, but this profitability erodes over time as real EC prices

fall. It should be emphasized that these projections assume that only CAP prices change, and that the production coefficients remain constant over time. The proper interpretation of these results is that 1982 technologies will come under increasing pressure as prices fall, and technological changes will be necessary if these systems are to remain socially viable. As CAP policies are introduced, Portugal and the Azores lose autonomy on output price decisions. Due to the nature of the financial organization of the CAP, EC prices become the social valuation of output for Portugal. Upon membership, Portugal will move from a set of policies that subsidize Azorean dairy systems relative to world prices, to one that taxes them relative to EC prices. This change simply reflects that fact that output price policies become to a large extent external to the Portuguese or Azorean policy decisions, and that policy objectives must be pursued at other points in the systems. The projections show that the likely downward trend in EC prices plus the elimination of the current gap between Portuguese and EC price levels is likely to reduce the level of subsidies to the Azorean dairy systems. Private profit for cheese fall significantly in 1986, but remains positive through 1995, whereas the milk powder activities both become unprofitable in 1995. These results suggest that there will be strong downward pressure on the real price of raw milk and that there will be a switch in the processing away from milk powder and butter towards cheese production.

### Endnotes

- <sup>1</sup> In the so-called 'unorganised zones,' the marketing is handled in part by private firms and in part by the state agency JNPP. These zones include the south and the northeast of the country.
- <sup>2</sup> In no way do these representative activity budgets reflect the operation of a particular dairy farm or processor.
- <sup>3</sup> For convenience, it was assumed that byproducts, the calves and cull cows, have a social value equal to their market price. Whey was also valued at its market price, but cream-for-butter was given a social value calculated by subtracting the social cost of processing butter from the world market price for that product.
- <sup>4</sup> Private and social prices can also diverge because of structural or other characteristics of the economy. For instance, production may entail costs (as pollution) not paid for by the producer. Or, in the absence of alternative employment, the social cost of using labor in an activity may be much lower than the private cost (i.e., the wage rate). For the most part, such 'externalities' are ignored here.
- <sup>5</sup> See the PES team 1982 Report for the justification for using this social cost of capital.
- <sup>6</sup> It should be emphasized that the definition of social price of output relates to the Portuguese economy as a whole, including the Azores. Hence, Azorean milk products are valued in as much as they substitute for non-Portuguese imports or can be sold in non-Portuguese markets. Should one wish to evaluate exports to mainland Portugal from the narrower point of view of the Azores economy, then the full price paid in Lisbon would become the "world price" as no export subsidy has to be paid by the Azores.
- <sup>7</sup> Strictly speaking, one should say that Portugal has a comparative advantage in producing cheese in the Azores. As mentioned above, from a purely Azorean viewpoint, the "world market" is the Lisbon market. All three products are profitable under that criterion.
- <sup>8</sup> In the case of cheese, it is not easy to define a comparable product on world markets. Dutch edam cheese is taken as a substitute for the Azores flamengo-type cheese in this study.
- <sup>9</sup> Though it is convenient to call this difference the effect of policy, it should be noted that it includes divergencies of a non-policy nature. A more exact definition would be "net policy distortions and uncorrected divergencies."
- <sup>10</sup> Estimating the contribution of the RAA to subsidy programs which operate at a Portugal-wide level is complicated by the nature of the budgetary process and the negotiation of the block grant from the mainland. No estimate has been made here of the net burden of these subsidies on the Azores economy.