Portuguese Agriculture in Transition

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Foreword

Occasionally scientists find opportunities to collaborate in endeavors that are both productive and enjoyable. One such opportunity occurred in 1981, when, under the auspices of the Office of International Cooperation and Development, United States Department of Agriculture, social scientists from the University of Arizona and Stanford University began a project in Portugal. This effort, funded by the United States Agency for International Development (AID), was part of the Portugal Program of Soil Correction, Fertilizers and Forages (PROCALFER).

The general objective of PROCALFER was to improve the efficiency and productivity of Portuguese agriculture. The particular goal of our work was to understand the constraints that affect the making of agricultural policy in Portugal, the sources of comparative advantage within the agricultural sector, and the technical changes that have recently begun to affect farming in the northwest of the country. Now, five years later, the Arizona-Stanford Policy and Economic Studies Team (PES) of PROCALFER has arrived at a point where it is appropriate to take stock. This book is a synthesis of what we have learned during the five-year journey. It presents a detailed fund of knowledge, from which we have essayed projections that have profound implications for policy and the dynamics of change.

During these five years, the PES team not only has produced numerous research documents on the economies of Portuguese agriculture but also has (1) held seminars, short courses, and workshops for public servants; (2) contributed to the extension of information within the Portuguese countryside; (3) raised the level of understanding about Portuguese agriculture in international forums; and (4) advised Portuguese policymakers about the European Community.

Without the untiring collaboration and assistance of the Ministry of Agriculture and, specifically, the Planning Cabinet, as well as the Regional Agricultural Services, the Superior Institute of Agronomy, and the countless Portuguese farmers who gave freely of their time and knowledge, this book would have been impossible. Friendships, intellectual satisfaction, and mutual rewards have resulted from this long-term association and from the preparation of the final document.

In my judgment, this book will be a definitive work on Portuguese agriculture for some years to come. The authors, whose standards are of the highest caliber, have at all times aimed at assisting the Portuguese agricultural sector in solving its problems. It has been my great pleasure to associate with them in this analysis and, along the way, to strengthen an affection earlier acquired for Lusitanian culture and the Portuguese people.

JIMMYE S. HILLMAN
PES Team Coordinator

Tucson, Arizona, July 1986

Abbreviations

ACA	accession compensatory amount
AGAA	Administração-Geral do Açucar e do Alcool
AGROS	União das Cooperativas dos Produtores de Leite de Entre Douro e Minho
CAP	Common Agricultural Policy
CCR	Comissão de Coordenação Regional
CCT	Common Customs Tariff
CIF	costs, insurance, freight
COPSOR	Cooperativa de Produtores do Vale do Sorraia
Credit PAR	Programa de Financiamento e Arrendatários Rurais
CVRVV	Comissão de Viticultura da Região dos Vinhos Verdes
DRC	domestic resource cost ratio
EC	European Community
ECU	European currency unit
EFTA	European Free Trade Association
EMS	European Monetary System
EPAC	Empresa Publica para Abastecimento de Cerais
FOB	free on board
GDP	gross domestic product
IAPO	Instituto do Azeite e Produtos Oleaginosos
IFADAP	Instituto Financeiro de Apoio ao Desenvolvimento da Agricultura e Pescas
IGEF	Instituto de Gestão e Estruturação Fundiária
INE	Instituto Nacional de Estatística
JCI	Junta de Colonização Interna
JNF	Junta Nacional das Frutas
JNPP	Junta Nacional dos Produtos Pecuários
JNV	Junta Nacional dos Vinhos
LIBOR	London Interbank Offered Rate
MACP	Ministério de Agricultura, Comercio e Pescas
NTR	net transfer ratio
OECD	Organization for Economic Cooperation and Development
PCR	private cost ratio
PES	Policy and Economic Studies Team

PROCALFER	Programa de Calcário e Fertilizantes
PROLEITE	Cooperativa Agrícola de Produtores de Leite do Centro Litoral
PSE	producer subsidy equivalent
SMP	skim milk powder
SRP	subsidy ratio to producers
UHT	ultra-high temperature

PART ONE

Constraints, Methods, and Policies

1. Constraints on the Development of Portuguese Agriculture

by Scott R. Pearson and Eric Monke

Popular opinion characterizes Portuguese agriculture as a lagging sector at least thirty years out of date. In much of the country, ownership and cultivation patterns are fragmented, rural education levels are low, and technologies are highly labor- and animal-intensive. The Ministry of Agriculture is characterized by top-heavy bureaucracy, a lack of political influence and access to budgetary resources, and a salary structure so low that many employees have second jobs. These observations have generated a great deal of pessimism about the ability of Portuguese agriculture to compete within the European Community (EC). They reflect the legacy of a half century of government alienation from much of the agricultural sector.

Closer inspection of Portuguese agriculture reveals a significant degree of dynamism since the 1974 Revolution. Reactions to the end of dictatorship brought forth a flurry of policy actions to promote agriculture. Numerous new policies—output and input price subsidies, credit programs, and land market interventions—have been attempted. Many of them, particularly in credit and land markets, have actually prevented the equitable development that policymakers have sought. But there have been successes as well, such as the support programs for milk production in the North and the transformation of the *latifúndios*, the large estates that dominated southern agriculture until 1974.

Before the Revolution, agriculture had been a lagging sector in an economy that had experienced rapid, though skewed, increases in national income. Despite its recent stagnation, the agricultural sector remains an important part of the Portuguese economy, accounting for one-fourth of national employment and one-eighth of national income. Policymakers in Portugal are thus confronted with the need to improve the performance of agriculture in order to maintain economic balance and create more rapid growth in aggregate income. These internal pressures for changing agricultural policies are exacerbated by Portugal's accession to the EC, in January 1986. The adoption of the Common Agricultural Policy (CAP) by Portugal will change both the locus of agricultural decisionmaking and the level of incentives given by the system of price supports. EC membership creates a new set of constraints on the develop-

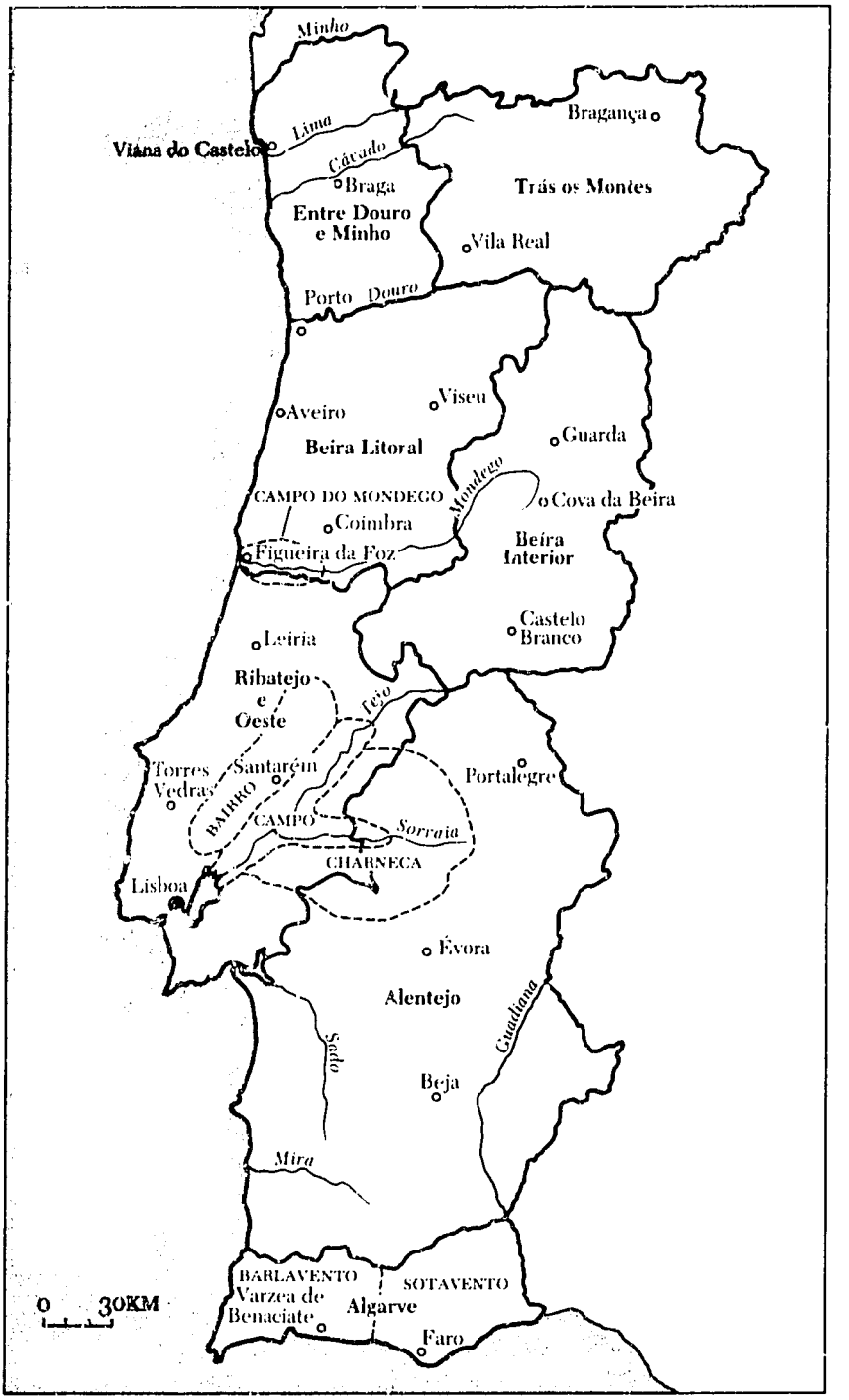
ment of Portuguese agriculture. The fundamental challenge for Portuguese policymakers is to take advantage of the opportunities provided by the shifting policy environment to effect constructive rural development.

But what types of policies might help bring about the technical and structural changes needed for Portuguese farmers to compete in the EC? For most agricultural products, the post-Revolution period has been marked by low or modest growth and increasing protection. This unimpressive performance has reflected a variety of physical, economic, and political constraints—fragile agroclimatic environments, distorted landholding structures, and government neglect or ineffectiveness. The approach followed in this book is to analyze the recent competitiveness and efficiency of Portugal's principal agricultural systems in order to identify pressures to modify constraints and to suggest opportunities for future change.

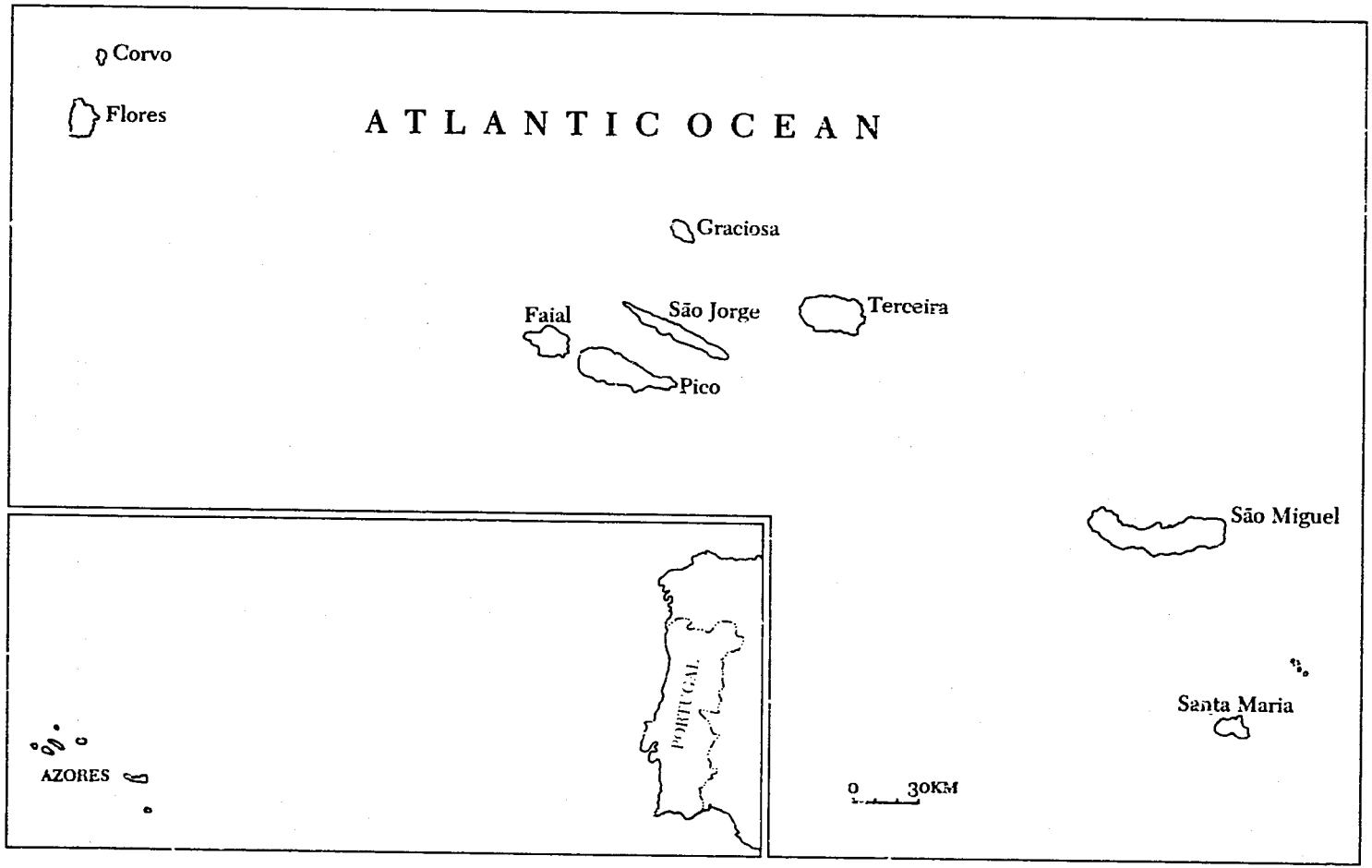
Physical and Technical Constraints

Topography and agroclimatic conditions vary considerably in Portugal. A useful categorization divides the country into three zones—the South (the Alentejo and the Algarve), the Center (the Ribatejo e Oeste), and the North (the Entre Douro e Minho, the Trás os Montes, the Beira Litoral, and the Beira Interior)—as shown in Map 1. The South is dominated by the Alentejo, a vast, rolling plain with a hot, arid climate. Although 2.2 million hectares are classified as cultivable land, soil quality is so poor that agricultural activity is limited to about 1 million hectares. Most of this area is of marginal quality; high-quality dryland soils represent only about 110,000 hectares, and existing and planned irrigated areas account for an additional 170,000 hectares. Principal products include wheat (about 250,000 hectares) and livestock (perhaps 1 million head of sheep and 0.4 million head of goats and cattle). Oats, barley, oilseeds, legumes, and corn occupy another 300,000 hectares. Yields of dryland crops and pasture are low by EC standards. Wheat yields, for example, are under 1.5 metric tons per hectare. Production practices and yields on irrigated land, however, are more similar to their western European counterparts; rice (5 metric tons per hectare) and tomatoes (35 metric tons per hectare) are the principal crops.

The Center (the Ribatejo e Oeste) is a highly diverse area of about 750,000 hectares containing a mixture of rolling hills suitable primarily for tree crops, poor dryland soils like those of the Alentejo, and rich alluvial soils on the banks of the Tagus River. The river valley areas are among the most productive in Portugal. Farms are typically 100 hectares in size and crop a variety of irrigated grains (primarily wheat and corn), oilseeds (sunflowers), and irrigated rice, tomatoes, and melons. Technological



MAP 1. *Regions of Portugal*



MAP 2. *The Azores*

practices and yields in this area are comparable to those of northern Europe; typical wheat and corn yields, for example, are 4 and 7 metric tons, respectively, per irrigated hectare.

Northern Portugal contains about 2 million hectares of cultivated land and remains the reserve of small-scale, intensive agriculture. High population density, particularly in the Northwest, has contributed to a pattern of small, fragmented farms that produce mainly for family consumption interspersed with somewhat larger and more mechanized farms that specialize in commercial sales of selected crops. Agroclimatic conditions vary markedly within the region, ranging from a flat coastal plain in the West to more mountainous terrain near the Spanish border in the East. Variation in microclimates has allowed a wide diversity of crops. Milk and corn are the most prominent commodities (three-fourths of mainland Portugal's milk is produced in the Northwest's coastal areas). Potatoes, corn silage, and wine grapes are also found throughout the region. Northern levels of technology, productivity, and income are among the lowest in Europe, and it is of little surprise that the North serves as the principal source of emigrant labor.

Agricultural censuses consider a farm anything larger than a backyard vegetable garden, and they thus overstate the number of actual small farms. More than one-half of Portugal's 900,000 farms are less than 1 hectare in size, and few of these farms depend on agriculture for a significant share of family income. Nevertheless, small-farm agriculture is prominent. More than 45 percent of the farms and nearly one-third of cultivated areas are managed in units of between 1 and 20 hectares. Small farms are particularly widespread in the northern half of the country, accounting for more than one-half of cultivated area. Larger farms dominate in the Alentejo; three-fourths of the cultivated area is held by farms of more than 100 hectares. The Ribatejo has a bimodal distribution, reflecting the heterogeneity of agroclimatic conditions.

Evidence of structural and technical change is indicated both in aggregate data and in the results of detailed surveys in the Northwest (the Entre Douro e Minho and the Beira Litoral). Although some problems exist with census data reliability, the results are consistent with a sluggish movement toward a commercial farm structure comprising the larger, more consolidated farms. Between 1968 and 1979 (the years of the two most recent agricultural censuses), the number of farms larger than 1 hectare declined from 500,000 to 440,000 (a decline of 1 percent per year) and their average size increased from 9.8 to 11.3 hectares. Declines in the numbers of farms under 100 hectares occurred in almost all regions. The reduction in the number of over 1 to 4 hectare farms was small in proportional terms but large absolutely; farms of this size account for two-thirds of all farms larger than 1 hectare. The number of very large farms (over

500 hectares) declined as well, reflecting the impact of the post-1974 land reform in the Alentejo. This reform is also responsible for much of the observed increase in the number of 100 to 500 hectare farms.

The consolidated farms were relatively small and fragmented, and their departures contributed to an increase in average farm size. In addition, the average parcel size of farms within each size category increased. Growth in farm sizes ranged from 10 to 25 percent across the size categories, and average parcel size grew between 23 and 124 percent. But the structure of agriculture has become increasingly dualistic; the cultivated area of large farms (more than 100 hectares) has increased, but so has the area of small (1 to 4 hectare) and noncommercial (less than 1 hectare) units. These changes were accomplished both by expansion in total area cultivated and by reduction in the area cultivated by medium-sized farms.

In spite of these modest rates of structural change, an active search for new input combinations has occurred in all regions, and the farm sector has become increasingly heterogeneous in technological practices. Microeconomic surveys and analysis of bank lending data indicate a gross investment of about $150 per hectare of arable area. In the Northwest, many farms have grown larger and more specialized. Average milk output per farm in the Beira Litoral, for example, more than tripled between 1967 and 1980; milk production per cow now varies between 2,000 and 5,000 liters annually, reflecting the enormous variations present in animal quality and management. Farmers have also increased their specialization in other crops, such as wine grapes, corn, and potatoes. Sales of white young wines (*vinho verde*), for example, more than doubled in the 1970s, and these wines increasingly have displaced the less marketable red *vinho verde*. In the South, technological changes have occurred mainly in the management of pastures for extensive lamb and beef production. The addition of fencing, improvement of natural grasses and legumes, and more careful management of seasonal grazing intensities have enabled substantial increases to be made in farm productivity and profitability. But technological change has been neither rapid nor widespread enough to narrow significantly the gap between EC and Portuguese productivity. With the principal exception of the alluvial soil areas of the Ribatejo, crop yields and animal productivity remain well below those of their European counterparts.

Government Responses to Agricultural Constraints

A principal objective of the research reported in this book has been to quantify the impact of Portuguese policies on the profitability of various agricultural systems. In brief, this method utilizes the analytical framework of social benefit-cost analysis. Domestic prices for outputs and inter-

mediate inputs are compared to their world market counterparts; in the labor and capital markets, social opportunity costs are derived from estimations of the impact of factor market policies (such as credit subsidies or labor taxation) on the domestic prices for factor inputs. Government policies (and market failures) create the divergences between evaluations in actual market prices and their counterparts in efficiency prices. These analytical procedures miss some indirect impacts of policies on profitability; changes in relative input prices can alter technical input-output relationships, and changes in relative output prices can affect wage and interest rates. But these problems can be addressed with sensitivity analysis or the identification of substitute technologies.

Most of the agricultural sector enjoyed positive profitability (returns to the fixed factors of land and management) in 1983, the base year for which budget data were collected. The only exception was the small traditional farming system in the North. Even with low labor costs (adult male wages were between $US 3 and $US 4 per day), these systems did not offer returns sufficient to cover the market value of labor. The large gains afforded by improved technologies in both the South (for sheep) and the North (for milk and wine) help explain the farmers' strong interest in adopting technological change.

Agricultural policies have had a large impact on observed profitability. With the exception of rice, melons, and sunflowers, net policy transfers to agricultural producers and processors offset a high proportion of the costs of nonfixed inputs. Portuguese rice and sunflowers are highly competitive at world prices, and their farm systems need no positive government assistance, whereas melons are little traded on international markets. Although the rice, sunflower, and melon systems are taxed in net terms, they retain healthy profit margins.

For the other commodities, policy transfers represent a major element in the generation of positive private profitability. In a few instances, where crops are grown on good soils—wheat and tomatoes in the Alentejo, grains in the Ribatejo, and potatoes in the Northwest—policy transfers amplify returns to fixed factors, usually by a large amount. But for many of the farm systems, where crops and livestock are grown on poor soils—wheat, sheep, and beef in the Alentejo, tomatoes in the Ribatejo, and milk and corn in the Northwest—net transfers to the systems are larger than private profits. Without the presence of subsidies, labor retained in these systems would earn below-market returns and land prices and rents would fall.

Output price subsidies are the dominant force in achieving the positive net transfers to most agricultural systems. Higher output prices, realized through producer purchasing schemes or protection from imports (usually through quantitative restrictions), have been the principal instruments of

agricultural policy. Output price interventions have been avoided only in the wine and melon markets. For most commodity systems, transfers through higher output prices represent half or more of the total net transfer; the only exception to this result occurs with pasture-fed beef, for which the output transfer is only one-fourth of the total. The other principal means of augmenting profitability has involved subsidies on intermediate inputs, primarily for fuels, fertilizers, and mixed feeds; these subsidies were largely removed in June 1983.

In its reliance on output prices as a principal method of intervention, the Portuguese approach to agricultural policy is quite similar to that used in the CAP. But there is a great difference between the effects of Portuguese policy and those of policy in other EC countries. Whereas other EC countries began a sustained process of technological and structural changes that allowed real prices for output to decline, Portuguese policy did little to allow increased production efficiency. Instead, as rising real wage rates and input prices increased production costs, policymakers responded mostly with further increases in output prices or input subsidies.

Milk policies represent an important exception to this generalization; government policies to develop the postfarm system of milk collection and processing have been critical to the growth of milk production in the Northwest. Cooperative milking parlors with refrigerated bulk tanks, refrigerated trucks for hauling fresh and processed milk, and modern, large-scale processing plants have become almost universal in the past two decades. These innovations have been promoted actively by government subsidy programs for equipment purchases and credit. Some successes also have been realized in the wine industry, through the development and dissemination of improved grape varieties (such as white *vinho verde* varieties in the Northwest and red varieties in the Alentejo) and the improvement of wine-processing facilities.

For most systems, however, endogeneously generated technical changes were absent. This failing reflects the dearth of capacity in basic agricultural research and the ineffectiveness of extension services in identifying producer needs and disseminating research results. The absence of research capacity has been particularly telling in Portugal, because technological practices and improved varieties could not be transferred easily. Significant differences in climate created the need for adaptive work before improved varieties could be disseminated, and differences in relative factor costs meant that foreign technologies were often unattractive when evaluated under Portuguese conditions. Although improved seed varieties for corn, wheat, and potatoes often perform better than traditional varieties, yields remain below levels attained in the source countries.

Agricultural policy has failed to promote structural change within the

sector. To a large extent, structural change depends on nonagricultural policies for growth and investment, and events of the last decade have hampered rather than enhanced the structural change process. Annual growth in per capita income has averaged 1 percent during the post-Revolution period, reflecting both a chaotic domestic economic policy and sluggish growth in markets for Portuguese exports. A shock to the economy resulted from the return to Portugal of about 0.5 million Portuguese workers from former colonies in the mid-1970s. As a result, the opportunities to absorb farm labor in nonagricultural employment were greatly constrained; between 1970 and 1980, the size of the domestic agricultural labor force remained at about 1.1 million. Emigration represents the principal alternative for domestic agricultural labor, but opportunities to work abroad have increased only slowly in recent years.

Macroeconomic policies also have hampered the structural change process through their impacts on the capital market. Since the Revolution, government budget deficits, financed in large part by borrowing from domestic credit supplies, have become chronic. The desire to limit interest rates (negative in real terms for most of the post-Revolution period) has forced the government to use quantitative credit controls as the principal means of controlling aggregate demand and inflation. Attempts to offset the impact of these controls on agriculture led to the establishment of a subsidized credit facility. But the plethora of conditions on and requirements for borrowing (including an infamous forty-page application form), the time delays inherent in requiring loan evaluations at the bank, ministry, and credit agency, and the relatively small size of agricultural loans has made the formal credit system an unattractive source of finance for all but the largest farmers. The ability of banks to exact interest in advance, particularly on nonallocated credit, also has raised the cost of capital significantly in real terms. These effects have been especially severe under recent conditions of high inflation and high nominal interest rates (20 to 30 percent).

The impact of credit policies has been not so much on the amount of agricultural investment as on the particular individuals and types of farmer who invest. These effects form part of the explanation for the particular patterns of structural change in farm size, discussed earlier. Large farmers use the formal credit system; they have both the expertise and the access to bankers that is necessary to obtain loans, and transactions costs are not a prohibitively high share of the loan amount (perhaps 2 to 3 percent of the loan value). Small farmers rarely use formal credit, but those involved in part-time, off-farm employment activities or emigration have the opportunity to self-finance at least part of their investments. A negative real interest rate on time deposits further encourages investment in real rather than financial assets. But for full-time small farmers

without access to this pool of funds, agricultural investment is often an impossibility. As a result, structural change has favored the growth of small, often part-time, farms (under 4 hectares) and large farms; those of intermediate size (4 to 50 hectares) are forced to leave the sector.

Finally, land market policies have done little to facilitate structural change. A number of policy initiatives with the avowed objective of helping small farmers have been implemented. But they have had just the opposite effect. Rent controls and the strengthening of tenant rights to land have eliminated the formal rental market. Official rates were initially established at a "just" share of gross revenues; subsequent efforts have been made to estimate rents on the basis of costs and returns. But regardless of method, official rates remain well below actual market rates. These constraints have encouraged the emergence of caretaker farmers—friends or relatives who can be trusted to manage the property until the return of the owner (usually an emigrant). Such allocations only reduce the potential supply of rentable land to full-time farmers who might be able to realize higher returns with their production activities.

Sales prices are not controlled, but regulations largely have eliminated the use of credit to buy land. For most loans, land purchases must be part of a consolidation operation for the farmer, and this consolidation is often interpreted by lenders to mean acquisition of a parcel contiguous to existing holdings. In addition, laws prohibit the subdivision of land into parcels less than administratively determined minimum units of cultivation. This minimum is set as 2.5 hectares in the North. But minimum sizes of parcels for economic cultivation are on the order of only 0.5 hectares. The critical issue for farm growth often involves increases in total area rather than increases in parcel size. As a result of well-intentioned but uninformed policy, those without access to informal sources of finance are largely excluded from the land market.

Differential rates of technological change between Portugal and the other EC countries and consequent implications for changes in output prices have caused Portuguese producer prices for many commodities to be established at levels above those under the CAP. The ten-year harmonization period (1986–96) thus will require a decline in real output prices for most Portuguese producers. (The main exceptions are the prices of potatoes, white *vinho verde*, rice, and sunflowers.) Furthermore, harmonization will need to focus on a moving set of CAP prices. Current opinion suggests that real CAP prices are likely to continue their downward trend. If this situation occurs, real rates of decline in Portuguese output prices will be even steeper than those suggested by comparisons of current prices. Moreover, Portuguese agriculture will likely be faced by rising real costs for many inputs. Most input subsidies (except for credit) must be terminated, and real labor costs are likely to continue to increase.

particularly if EC membership stimulates industrial sector output and growth of national income. Portuguese agricultural policymakers thus face the prospect of significant declines in private profitability and a limited set of policy instruments available to reduce constraints and improve farm incomes.

Organization of the Book

This book investigates the policy shock of EC accession for Portuguese agriculture. The imposition of CAP policies creates both opportunities and problems for policymakers wishing to break or alleviate the constraints limiting productivity gains. What choices are open to rationalize Portuguese agriculture? The organization of topics in the book reflects a building-block approach to providing the information and analysis that attempt to address this fundamental question.

The book is organized into four parts; they deal, consecutively, with method and background, regional analysis of agricultural systems, technical change in the Northwest, and policies and strategies for future change. Part 1 encompasses this chapter and the three that follow it. The purpose is to set the stage for the succeeding empirical analysis by raising issues in the context of constraints (chapter 1) and by clarifying the methodology of the study (chapter 2). The empirical approach chosen to analyze Portuguese agricultural systems allows separate identification of the impacts of fundamental economic constraints—levels of technology and prices of inputs and products—and of government policy transfers. Prices and policies affecting them are critical aspects of the analysis. Two additional chapters therefore review the recent history of agricultural price policy (chapter 3) and factor (labor, capital, and land) price policy (chapter 4). The implications of future applications of CAP policies in Portugal are also considered in chapter 3, and the checkered history and likely future evolution of agricultural factor prices and related structural policies are addressed in chapter 4. From part 1, readers should gain an understanding of the pattern of recent and projected prices and of how they are affected by world price trends and by Portuguese and EC decisions.

Technology and agroclimatic zones are introduced in part 2. Four chapters present the results of analyzing the past and possible future competitiveness, comparative advantage, and effects of commodity and macroeconomic policy for thirty-three agricultural systems within five provinces of Portugal—the Alentejo (chapter 5), the Ribatejo e Oeste (chapter 6), the Azores (chapter 7), and the Entre Douro e Minho and the Beira Litoral (chapter 8). The constraints on Portuguese agricultural policy thus are analyzed in part 2 according to representative commodity systems within well-defined geographic regions. The systems selected for study

highlight developments in principal commodities and show differences in likely regional impacts of changes induced by declining real CAP prices and increases in real wages. The intent is to identify the underlying efficiencies, or comparative advantages, the supporting influences of recent policies, and the pressures for technical and structural changes in existing systems as profitability alters.

Part 3 explicitly examines the pattern and prospects for reducing costs by introducing improved technologies. The aim of the three chapters in this part is to provide an in-depth analysis of the history and process of farm-level technical change in small-scale farming systems that are likely to be placed under severe competitive pressures by EC-related policy changes. Rapid technical change in farming practices is contrasted with sluggish structural change in landholdings and farm sizes. The results include an analysis of the history of and constraints on technical change in one parish in the Entre Douro e Minho (chapter 9), which shows how and why very poor, largely illiterate, small-scale farmers have altered vastly their techniques of farming during the past twenty years; a study of six representative whole-farm systems (chapter 10), which applies a model of the process of technical change in a region of highly constrained land transactions; and an investigation of alternative future technical and structural adjustments in northwestern agriculture (chapter 11), which considers different evolutionary patterns of structural adjustment and how policy responses might encourage or impede their occurrence. This part of the book concentrates on the principal problem area in Portuguese agriculture and draws on the disciplines of economic anthropology and agricultural economics to suggest solutions.

The concluding part of the study, part 4, examines the separate and collective impacts on agricultural systems of commodity-specific and macroeconomic policies. The goal is to summarize and evaluate the various effects of policy reported in earlier parts of the study in an effort to discern patterns and to look in aggregate at prospects for and likely effects of policy change resulting from EC membership and Portuguese domestic policy. The breakdown of policy is between commodity-specific actions affecting products or markets (chapter 12) and macroeconomic policies influencing costs of factor services (chapter 13). The study concludes with a summary chapter that examines alternative agricultural development strategies in Portugal (chapter 14). Part 4 considers whether alternative future paths for EC commodity policies or for Portuguese macroeconomic policies would ease significantly the pressures for adjustment that are expected to be felt, especially in the Northwest and in the poor-soil areas of the Alentejo. The ultimate objective is to define a desirable agricultural strategy to rationalize Portuguese agriculture when policymakers have available only a tightly constrained choice of workable policy instruments.

2. Methods of Analysis

by Scott R. Pearson

The construction of matrices for efficiency and policy analysis, the method of analysis used in this study, simultaneously addresses three related issues: the prospective changes in levels of agricultural income, the contributions of agriculture to efficient growth of national income, and the income transfers resulting from commodity and macroeconomic policies. Such changes will be influenced by Portuguese policies, EC regulations, and farmers' decisions to invest in and adopt more productive technologies. The analysis thus needs to consider the relationships between changes in policies and the decisions by agriculturalists to alter their production behaviors.

The main task is to construct, for each agricultural system studied, a set of accounting matrices of revenues, costs, and profits, first including and then excluding the effects of policy. The first matrix in each set contains information for a base year, 1983. Results from the base year calculation are then contrasted with outcomes from projected data for the period of Portugal's gradual transition to full application of the EC's CAP, assumed to be 1986 through 1996. The projected matrices are based on assumptions about changes in the underlying price and policy variables and, for the Northwest only, in the technologies of production.

In any given year, the impact of Portuguese policy can be gauged through comparison with the situation in the absence of such policy. This efficiency calculation assumes that policymakers have available a full range of policy options. However, once Portugal enters the EC, its choice of policy will be constrained by EC regulations, and thus a second calculation, of projected efficiency, is necessary to incorporate this limitation. This chapter explains the construction of the accounting matrix and the derivation of the measures of efficiency and projected efficiency used for the policy analysis. Methods to analyze dynamic comparative advantage are introduced here and are applied later to farming systems in northwestern Portugal. The chapter concludes with a discussion of the research plan followed in this study.

Profitability and Efficiency

The basic accounting identities that underlie the analysis are illustrated in Table 2.1. The first identity measures profits as the difference between

TABLE 2.1. *Accounting Matrix for Static Efficiency and Policy Analysis*

	Revenues	Costs		Profits
		Tradable Inputs	Domestic Factors	
Private prices	A	B	C	D[1]
Social prices	E	F	G	H[2]
Effects of policy and market failures	I[3]	J[4]	K[5]	L[6]

[1]Private profit, D = (A − B − C).
[2]Social profit, H = (E − F − G).
[3]Output transfers, I = (A − E).
[4]Input transfers, J = (B − F).
[5]Factor transfers, K = (C − G).
[6]Net policy transfers, L = (D − H) = (I − J − K).

revenues and costs, where the cost items include both purchased inputs and domestic factors. This profit measure can either be in private (observed) prices or in social (efficiency) prices. Private profitability is calculated as the residual remaining when actual market costs of inputs—materials and factors—are subtracted from the market value of the output. Calculation of private profitability for the base year is the first step in the analysis; it shows how producers actually have reacted to the incentives created by government policy. The systems are defined to include four activities—farming, farm-to-processor marketing, processing, and processor-to-wholesaler marketing. Revenues, costs, and profits are measured separately for each of the four activities in the system; then entries are aggregated to represent the entire system. In Table 2.1, the calculation of private profitability (entered as D) is represented in the top row; revenues (A) less input costs (B) less factor costs (C) yield profits (D), with all entries given in private (actual market) prices.

The analysis is organized according to commodity systems because many agricultural policies pertain to individual commodities. Farmers, however, typically consider the private profitability of their entire farming enterprise, incorporating the results from all crops and animal products that they produce. When farming systems include a complicated mixture of intercrops and rotations, the profitability analysis can be reintegrated to focus on the whole farm rather than on separate commodities. The whole-farm analysis permits careful treatment of jointly produced agricultural commodities and of intrafarm substitutions as relative prices change. This approach is used in chapters 10 and 11 to study the evolution of small-scale farms in northwestern Portugal.

The evaluation of profit in social terms requires measures of outputs and inputs (and hence profits) in prices that represent underlying scarcity values or social opportunity costs. Social prices, if reflected in actual decisions, would result in optimal allocation of scarce resources and thereby generate the highest national income. The crucial task with effi-

ciency analysis, therefore, is to find reasonably accurate approximations for the social prices of outputs and inputs in the system.

For commodities that are tradable internationally, the appropriate social prices are the world prices—CIF (costs, insurance, and freight) import prices for importables and FOB (free on board) export prices for exportables—that approximate expected prices over the next decade. The government always has the choice of importing to meet domestic demand at a cost to the economy of the foreign exchange needed to buy the imports or of exporting to earn such foreign exchange. Inputs needed for domestic production also can be either imported or domestically produced. Hence, the world price is the appropriate standard for valuing the costs of all tradables.

Two other kinds of inputs require different treatment, however, because no world price is available for social valuation. Domestic factors of production, labor and capital, are evaluated with respect to their social opportunity cost—the amount of national income foregone by removing a unit of the factor from its next best alternative activity. Scarce factors provide valuable services in production; the social opportunity cost of each factor is a measure of that scarcity. A key distinction is made between fixed and variable factors. Labor and capital are considered variable factors. They are assumed to be allocated freely between alternative uses. Land, however, is considered a fixed factor in agriculture. Its price is determined as a share (not known) of the profits left over after all variable factor and intermediate input costs are subtracted from revenues. In addition, nontradable inputs, such as government services and many other services, local transportation, and commodities with high international transportation costs, cannot be evaluated by making world price comparisons, since by definition they do not enter international commerce. For efficiency analysis, the social costs of nontradable inputs are disaggregated into their underlying tradable input and domestic factor costs, the two cost categories shown in Table 2.1.

The calculation of social profitability follows easily, once the revenues and costs have been evaluated in social prices. With reference to the symbols in Table 2.1, the social prices of output (E) and of tradable inputs (F) are given by CIF import or FOB export prices, the social valuations of factors (G) are their social opportunity costs, and social profitability (H) is the difference between revenues and costs in social prices ($H = E - F - G$). If social profits are positive, the activity is competitive at world prices and thereby is an efficient user of scarce resources and contributor to national income.

A qualification often arises because of the difficulty of costing land used in farming. Private costs of land can be measured by the market land rental rate, but the social opportunity cost of farmland is sometimes im-

possible to estimate accurately. Within any agroclimatic zone, one rarely observes complete specialization—that is, cultivation of only the most profitable crop—because farmers prefer rotations or intercropped systems to reduce risks of price variability, yield reduction, and pest and disease infestation. Therefore, the social opportunity cost of the land is not approximated accurately by its social rent from a single best alternative crop; instead, it is measured correctly by some weighted average of the social rents accruing from the set of crops planted.

Because the correct weights and social rents associated with each crop in the set generally are not known, it is convenient in assessing farming activities to reinterpret profits as returns to land and other fixed factors (such as management and the ability to bear risk) per hectare of land used. This reinterpretation is done by including private (and social) returns to land as parts of D (and H). Profitability per hectare is then interpreted as the ability of a farming activity to cover its variable costs, in either private or social prices. However, to analyze the producers' incentives to use a particular agricultural system, it is necessary to impute a private cost for land, using a market rental rate, and to estimate a social cost for land, by making assumptions about the weights and social profits of the set of alternative activities. This procedure permits the use of the concepts summarized in Table 2.1. Social evaluation permits rankings of alternative systems from highest to lowest profit. Examination of the rankings gives a quantitative idea of the trade-offs between income and risk-averse behavior.

Tradable input and output are valued directly in terms of foreign exchange, and thus the difference between the value of tradable output (E) and all tradable input costs (F) gives an indication of the balance-of-trade contribution of an activity. However, because positive social profitability indicates the ability of an economic activity to use scarce domestic resources (G) to generate foreign exchange (E − F), the activity can save or earn foreign exchange only if it is socially profitable. As long as domestic factors are scarce, their costs need to be included in evaluations of foreign exchange effects; the net actual foreign exchange saving is therefore E − F − G, which is the measure of social profitability. In this context, positive social profitability is an indication of comparative advantage, or the ability to compete in international trade efficiently—that is, without the stimulus of subsidies or other government assistance. If future world prices and existing production technologies are assumed not to change, the analysis provides measures of static comparative advantage.

Effects of Policy

The second fundamental accounting identity in the analysis is the difference between the valuation of any column entry in Table 2.1 (reve-

nues, costs, or profits) in private prices and in social prices. This difference represents a measure of the effects of policy plus the effects of any market failures (impediments that prevent product or factor markets from allocating outputs or inputs efficiently). In the remainder of this section it is assumed that market failures are unimportant or are offset by corrective policy. This simplifying assumption allows emphasis to be placed on the effects of distorting policy.

There is a close relationship between calculation of social profitability and measurement of the effects of distorting policy, as shown in the third row of Table 2.1. In the absence of market failures, only government policy can cause a divergence between private and social prices. Unless the government enacts a protection policy, for example, each importable output and input will be available at its CIF import price, which will in turn become the domestic price. In Table 2.1, A will equal E and B will be the same as F. Consequently, any difference between A and E or between B and F is caused by some combination of trade restriction, tax/subsidy, price control, or exchange rate policies. If A exceeds E, either domestic consumers are forced to pay higher than world prices or the government treasury is directly subsidizing production, causing an output transfer (I) equal to A − E. Similarly, if B is greater than F, tradable inputs are being taxed; the result is an input transfer (J). For domestic factors, the transfer K amounts to C − G; if there were a positive transfer to the system, say from a credit subsidy, then C would be less than G and K would be negative. Factor price policy, including credit subsidies or rationing, minimum wage laws, and land rental controls, can cause private factor costs to exceed or fall short of comparable social opportunity costs.

The social prices of tradable outputs (E) and of tradable inputs (F) are established internationally, since Portugal has little or no market power in most agricultural commodities. Commodity price policies in Portugal therefore have no significant effect on the social valuation of tradable commodities. Exchange rate policy can, however, cause the private prices of tradables (A and B) to be either higher or lower than efficiency levels (E and F) in a manner that is directly analogous to the use of a trade-restrictive policy for a given output or input. This result would be achieved, for example, if the government employed a fixed exchange rate policy and chose fiscal and monetary policies that permitted a rate of inflation higher than the weighted average rate experienced in its trading partner countries.

An overvalued exchange rate depresses the prices of tradables relative to those of nontradables and thus acts as a tax on all tradable (exporting or import-substituting) activities and as a subsidy on imports. For example, if the exchange rate were overvalued by 20 percent, imports of corn would be 20 percent cheaper in domestic currency than their social op-

portunity cost and local corn farmers would receive 20 percent less for their output (in the absence of commodity policies affecting domestic corn prices). In Table 2.1, A would be less than E by 20 percent, and the effect of the overvaluation exchange rate policy would be shown in I. This taxing effect of overvaluation on output would be offset partially by a subsidizing effect on tradable inputs (B − F = J would be 20 percent of F because of overvaluation); the corn farmer would receive tradable inputs at prices 20 percent less than what they would be if the exchange rate were in equilibrium.

The social prices of domestic factors (G) are given by determination of social opportunity costs, which reflect underlying supply and demand conditions in domestic factor markets. In the short run, these social prices are largely unchanged by either macro or commodity policies. In the longer run, they will change with economic growth and structural development. The government can, however, enact tax or subsidy policies for one or more of the factors (capital, labor, or land) that create a divergence between private costs (C) and social costs (G), resulting in a subsidy to the system or a tax on the system.

The net transfer (L) from all policies equals the output transfer (I) less the input transfer (J) less the factor transfer (K). The net transfer can also be found by the subtraction of social profitability from private profitability (L = D − H). Depending on the net incidence, subsidy policy can thus create positive private profitability when social profits are negative, whereas taxing policy can cause negative private profits even when the activity is socially profitable.

In summary, the collection of data for private and social revenues and costs (A, B, C, E, F, and G) permits the calculation of private profit (D), social profit (H), net transfers from all policies (L), and output, input, and factor transfers (I, J, and K). This method of analysis thus allows measurement of private profitability or competitiveness (indicated if D is positive), social profitability, efficiency (or comparative advantage, indicated if H exceeds 0), and estimates of net transfers from policies (net subsidy to the activity if L is positive, net tax on it if L is negative), which show the incentive effects of commodity and macro policies on private profitability.

The social valuations of tradables (E and F) are unaffected by Portuguese policy, but the social costs of domestic factors (G) are influenced by macro decisions. Hence, social profitability (H = E − F − G) is affected by macro policy choices as the relative scarcity of factors shifts with economic growth. Although Portugese commodity policies do not importantly influence world prices or social profits, the combination of commodity and exchange-rate policies can cause actual market prices of tradable outputs and inputs to diverge from world prices in either direction.

Comparison among Systems

The measures illustrated in Table 2.1 are sufficient to analyze a single agricultural system or to compare two or more systems that produce the same commodity. But a precise meaning cannot be attached to a comparison among systems producing different outputs; for example, no clear choice can be made between a system that yields social profits measured per ton of beef and one that generates social profits measured per ton of wheat. The formation of certain ratios facilitates such comparisons.

Five derived measures are as follows (the symbols are drawn from Table 2.1):

1. Private cost ratio (PCR) = C/(A − B).
2. Domestic resource cost ratio (DRC) = G(E − F).
3. Net transfer ratio (NTR) = K/(I − J).
4. Producer subsidy equivalent (PSE) = (L/A) . 100 percent.
5. Subsidy ratio to producers (SRP) = (L/E) . 100 percent.

The first three ratios allow a comparison among systems of private profitability, social profitability, and net transfers, respectively. PCR is the cost of domestic resources, valued in market prices, required to generate a unit of value added (also in market prices), and DRC is the cost of domestic resources, in social prices, needed to produce a unit of value added (in world prices). NTR contrasts the level of policy transfer that occurs through the factor markets (K) with the transfer taking place in commodity markets (I − J). In each instance, the ratio is $\gtrless$ 1 if its analogue in the profits column of Table 2.1 is $\gtrless$ 0. For example, efficiency is exhibited if DRC < 1 and social profits are H > 0.

The last two measures give a convenient summary of policy transfers in percentage terms. PSE is the percentage subsidy, relative to private receipts, that would substitute for the actual mixture of commodity and macroeconomic policies in the system. SRP is an analogous percentage subsidy but is relative to social receipts and thus indicates the degree of net policy transfer as a percentage of what receipts would be in the absence of policy.

Projected Efficiency and Profitability

Because Portugal has become a member of the EC, policymakers will lose a considerable amount of control over agricultural and trade policy. The concept of projected efficiency refers to the evaluation of policy choice that remains after entry. Even when EC policy is accepted as given, Portugal retains the ability to set certain policies. For agricultural systems, Portuguese decisionmakers can still choose policies for some tradable inputs and for domestic factors. But the CAP will set output

prices for grain and livestock products, and the Common Customs Tariff (CCT) will determine almost all import policies and hence affect most input prices.

Table 2.2 shows the data categories relevant for a projected efficiency analysis of a Portuguese agricultural system. The structure is analogous to that of Table 2.1, but some important differences exist. Euro-social prices reflect Portugal's constrained set of policy choices following entry into the EC; the world market price is no longer the relevant standard for comparison. Short of giving up membership, which is not considered in this study, in most instances Portugal must accept CAP output prices as its social output prices (subject to arrangements made for transition) and world prices inclusive of CCT tariffs as the social costs of tradable inputs. This result arises because Portugal pays levies and tariff receipts to the EC and receives export subsidies from the EC Farm Fund; if revenues were kept by Portugal, Euro-social values would remain equal to world prices for tradables.

The valuation of all revenues typically is identical in both private and Euro-social terms (A = E'). Tradable inputs subject to trade restrictions generally are controlled by EC policy, and domestic taxes or subsidies on tradable inputs are controlled by Portuguese policy. For domestic factors, which will continue to be controlled by Portuguese policy, decision-makers have the option of choosing policies that would affect factor use and thus result in a divergence between C and G'. The treatment of subsidies that Portugal might be allowed to keep is discussed in chapter 3.

The top row in Table 2.2, private prices, is identical to the top row in Table 2.1. During the projection period, through 1996, entries in this row pertain to given assumptions about Portugal's entry date into the EC and about the type and length of the transition period before the commodity faces full EC prices.

The middle row contains a calculation of Euro-social profitability, from which one can obtain a measure of constrained efficiency of resource use,

TABLE 2.2. *Accounting Matrix for Projected Efficiency and Policy Analysis*

	Revenues	Costs		Profits
		Tradable Inputs	Domestic Factors	
Private prices	A	B	C	D[1]
Euro-social prices	E'	F'	G'	H'[2]
Effects of Portuguese controlled policy and market failures	I'[3]	J'[4]	K'[5]	L'[6]

[1]Private profitability, D = (A − B − C).
[2]Euro-social profitability, H' = (E' − F' − G').
[3]Projected output transfers, I' = (A − E'); for grain and livestock products, typically E' = A and hence I' = 0.
[4]Projected input transfers, J' = (B − F').
[5]Projected factor transfers, K' = (C − G').
[6]Projected net policy transfers, L' = (D − H') = (I' − J' − K').

given that Portugal conforms to EC commodity policy. This indicator differs importantly from static social profitability, measured in Table 2.1; the latter results if no constraints exist on Portuguese policy. However, Euro-social prices are established by EC decisions, not by world market trends. *Projected comparative advantage* refers to projections of base year data that incorporate both Euro-social prices and expected changes in the costs of labor and capital. The measures of Euro-social profitability (H) thus indicate projected comparative advantage—the efficiency of Portuguese agricultural systems within the EC, given projections of changing relative prices for labor and capital, fixed technologies, and constant long-run world prices.

The bottom row, which shows the difference between Portuguese policy prices (as modified by gradual entry into the EC) and Euro-social policy prices, measures the impact on revenues, costs, and profits of Portuguese-controlled policies for the year in question. Hence, the net transfer attributed to Portuguese policy (L′) equals the difference between profitability at Portuguese market prices and profitability at Euro-social prices (D − H′) and the sum of its components (L′ = I′ − J′ − K′).

Symmetry between the efficiency and projected efficiency analyses carries over to the formation of derived measures to permit comparisons among agricultural systems. For brevity, the five ratios are not repeated here. Their use is explained in the chapters in which they appear.

Dynamic Comparative Advantage

Comparative advantage, the ability of an agricultural system to compete in international trade efficiently, can be strengthened or eroded by changes in economic conditions. *Dynamic comparative advantage* refers to shifts in a system's competitiveness that occur over time because of changes in one or more of three categories of economic parameters: long-run world (or Euro-social) prices of tradable outputs and inputs, social opportunity costs of domestic factors of production (labor, capital, and land), and production technologies used in farming or marketing. Together, these three parameters determine social profitability and comparative advantage. The term *dynamic* denotes a passage of time sufficient to permit changes to occur in any or all of these fundamental variables.

The appropriate world prices for measuring efficiency, or comparative advantage, are long-run equilibrium levels that approximate best guesses of future price trends. If Portugal's decisions to buy or sell on world markets will not have any measurable effect on world prices, those prices will not be influenced by Portuguese policy decisions. Hence, world prices are exogenous for Portugal and, once arrived at, are givens for

Portuguese agricultural systems. In the absence of knowledge of future prices, most analysts project constant long-run world prices (after adjusting for inflation) rather than gradually (or abruptly) rising or falling prices. New information might lead one to want to change the constant price guess or to project continually increasing or decreasing future prices. In the accounting matrix framework, this change is easily incorporated. The introduction of EC prices as Euro-social prices in the projected efficiency matrix is an example of changed world price assumptions; if EC prices serve as arbiters of social values, movements in actual world prices are irrelevant to Portuguese policymaking (except in the extreme instance of Portugal's decision not to be a member of the EC).

Costs of factor services within Portugal can be expected to change with time. Cyclical variations in wage and interest rates (in real terms, after adjustments for inflation), associated with swings in macroeconomic policy, are not the primary focus of this study. Instead, interest centers on long-run trends in costs of labor, capital, and land. As economies achieve higher levels of national income, real wages typically rise, absolutely and relative to real costs of capital and land. For agricultural systems in Portugal, the social opportunity costs of labor and capital are determined in economywide integrated factor markets, not within agriculture. Therefore, these factor prices are exogenous to agriculture, and future projections of real wages and capital costs need to consider changes in the national environment for investment and growth, as influenced by expected directions of macroeconomic policy and likely impacts of membership in the EC (see chapters 3, 4, 12, and 13). Land rental rates are endogenous to agriculture but will be constrained by changes in world prices and in real wage and interest rates, because payments to the owners of land and other permanently fixed factors must come out of profits. The analysis of projected comparative advantage, discussed earlier, includes both the future pressures that changing real factor prices might exert on existing agricultural systems and influences of likely future EC policies and prices. The results identify systems that can expand readily in contrast to those that will have to contract or change in order to survive.

Changes over time also can influence agricultural technologies—the combinations of inputs employed to produce given outputs. Technological change permits commodities to be produced with reduced per unit costs of one or more inputs. Such change is associated with rising agricultural incomes, growing farm productivity, and faster increases in national income, and it depends on investment in knowledge and in new inputs. In this study, *dynamic comparative advantage* refers to projected changes in Euro-social prices, relative factor costs, and technologies.

Technological changes arise when farmers invent new cost-reduction

methods. Such change is a response especially to differing patterns of relative factor prices over time. Farmers are induced to innovate by finding new ways of using less of those factors that become relatively more expensive (usually labor) and more of other inputs. Empirical analysis of intrasystem change requires application of partial budgeting, a technique in which individual cost-saving changes are analyzed within the matrix for the initial system.

Technological innovations in agriculture spread because changes in the opportunity to make private profits (resulting from differing world prices, domestic factor costs, and policies affecting them) and the ability to make investments cause farmers to shift away from current practices by adopting different, more productive systems already being used by other farmers in the region. One can envision a spectrum of increasingly investment-intensive but also more cost-efficient systems. As economic conditions, knowledge, risk, and access to investable funds permit, farmers gradually move from the lower to the higher technologies (that is, from less to more efficient systems). Analysis of the diffusion of technological change is mainly an adding up exercise of shifting the proportional weights attached to the various systems within a region.

Research Plan for Efficiency and Policy Analysis

The analysis of static comparative advantage and policy transfer is based on six research inputs (A, B, C, E, F, and G in Table 2.1). Data are gathered initially on private revenues, tradable input costs, and factor costs through the construction of budgets describing the production technologies for farming and marketing within each system. Comparable data then are found for world prices of tradable outputs and inputs (calculated at appropriate exchange rates) and for shadow prices (social costs) of domestic factors. The assembly of these data provides research outputs to address all three principal issues of the study: private profitability (D) measures agricultural incomes, social profitability (H) indicates comparative advantage and the contribution to efficient growth of national income, and net policy transfers show the individual (I, J, K) and collective (L) effects of commodity and macro policies.

Additional research inputs are needed for projected and dynamic analysis of efficiency and policy. In addition to the information already given, the analysis of projected comparative advantage requires information on the time frames for Portugal's transition to full EC policies, which differ according to commodity, and on the pattern of changes in social product and factor prices during and after the transition. The principal assumption underlying the Euro-social projections is that the EC-determined product prices and Portuguese labor and capital prices (in real terms) will

change according to the projected patterns but the agricultural technologies will remain fixed. For the dynamic analysis, all three parameters are permitted to vary from the base case. Various scenarios are set up to trace the implications of combinations of assumptions about future measurements in social product prices (EC prices after accession), relative factor prices, and projected technologies. This added information allows comparison of the base case results with results that incorporate time-induced changes in all of the basic parameters.

Summary

The central purpose of this analysis is to measure the impact of Portuguese and EC policy on the private profitability of Portuguese agricultural systems and on the efficiency of resource use. Farmers, processors, and merchants will increase output only if it is profitable for them to do so. The degree of incentive provided by policy is measured relative to three alternative standards. The first standard contrasts private profitability, occasioned by actual or projected policy, with underlying efficiency, or static comparative advantage, as measured by social profitability at world prices. The second standard is a measure of projected efficiency, which is of interest because of the recent Portuguese accession to the EC. This measure of projected comparative advantage shows how efficient existing Portuguese agricultural systems will be as the set of EC price policies for commodities and inputs gradually is adopted by Portugal and the costs of labor and capital change. For systems in northwestern Portugal, sufficient information has been collected to allow the study of a third standard, dynamic comparative advantage, incorporating changes over time in technologies as well as in factor prices and EC prices.

Private profitability and competitiveness are likely to be uppermost in the minds of those concerned specifically with agricultural incomes. Social profitability and efficiency can be expected to be emphasized by economic planners whose concern is the allocation of resources among sectors and the growth of aggregate income in the economy. Both sets of issues ultimately are concerned with the incentive effects of policy—the difference between private and social profitability—and how policy choices might be influenced by entry into the EC. The method is designed to illuminate these issues through a direct evaluation of private and social revenues and costs before, during, and after the decade of Portugal's likely transition to full application of EC policies, 1986–96.

3. Commodity Policies

by Timothy Josling and Stefan Tangermann

The policies that Portugal has evolved to regulate and influence agricultural markets reflect particular economic and political structures. The dominant force in shaping these structures was the corporate state, the *Estado Novo;* it was introduced by Salazar in the late 1920s and survived until the Revolution of April 25, 1974. Under this system, the state controlled the political and economic activities of individuals and enterprises. It oversaw wages, prices, and investment decisions, in the process developing a mutually protective relationship with a small section of the business community. Favored firms were protected from external competition and internal labor problems. Firms that were not so advantaged found investment funds scarce and the rewards for risk-taking small.

Agriculture was not seen as a favored sector, although the regime generally had the political support of the large landowning families of the South. The production of wheat in the Alentejo was supported by a generous price policy, new crops were introduced in the Ribatejo, and extensive irrigation schemes were undertaken. But the prevailing view of agriculture was that of a backward sector with a passive role in economic growth. Price policy was geared largely to the provision of low-priced foodstuffs to urban areas, requiring extensive control over marketing and pricing. State boards enjoyed the exclusive right to import many food commodities, completing the isolation of the domestic market from outside influences.

The 1974 Revolution brought dramatic changes—first by replacing the ultraconservative corporatist state with a socialist regime and after 1976 by allowing the establishment of a mixed economy along the lines of most other western European countries. Institutions changed as those associated with the former regime were replaced by others reflecting the new ideas; the new political generation took charge; and activities were altered to match the new aspirations. In addition, world economic circumstances changed equally dramatically at about the same time; among the changes were a fourfold oil price increase, a commodity price boom, and the start of a period of rapid inflation and currency instability. Present policies reflect the overlay of changing political structures on this unstable economic base.

As if these changes were not enough, Portugal's accession to the EC in January 1986 has placed Portuguese agriculture and agricultural policy under pressure to modify price levels for major commodities and to modify policy instruments. Moreover, the institutions that implement Portuguese commodity policy, including the parastatal marketing agencies and certain government departments, are undergoing a dramatic reorganization. The private sector will also participate in this reorganization, acquiring greater scope and responsibility in both domestic and overseas marketing.

To help track these various changes, it is useful to distinguish five areas of commodity policy. Marketing policy influences the institutional structure of the markets in which farmers sell produce; output price policy sets the prices received for farm products; input price policy sets the prices paid for intermediate inputs; trade policy controls import and export flows; and public investment policy can help lower farm costs and stimulate technical change. These five areas of commodity policy are the subject of the first part of this chapter; together with factor market policy (reviewed in chapter 4), they shape the economic environment of agriculture. This chapter also introduces the projections of output prices for the next decade, which are used in profitability analyses later in the book.

Marketing Policy

Portugal has a long history of state intervention in the marketing and trading of farm products. This intervention, which has been more extensive than that in most other western European countries, reflects the desire of the corporatist regime to maintain control over basic economic activities and the consequent limited role that small or medium-size private firms have had in the economy. It is manifested most strongly in the public institutions used to implement price policy. As Portugal attempts to move toward industrial democracy and a modern mixed economy, the role of these institutions has come under review. The task has been to find a mechanism—one that will allow greater efficiency and more dispersed decisionmaking—to replace the public institutions without undue disruption of organized marketing functions.

The six major public institutions involved in agricultural marketing can be divided conveniently into two groups. The first group contains the Empresa Publica para Abastecimento de Cerais (EPAC), the Instituto do Azeite e Produtos Oleaginosos (IAPO), and the Administração-Geral do Açúcar e do Alcool (AGAA). These state enterprises were set up after the 1974 Revolution primarily to manage trade in their respective commodity groups—cereals, oilseeds, and sugar and alcohol—in pursuit of price control objectives. They replaced earlier institutions that performed sim-

ilar functions under the prerevolutionary regime. The second group contains three marketing boards, the Junta Nacional dos Vinhos (JNV), the Junta Nacional dos Produtos Pecuários (JNPP), and the Junta Nacional das Frutas (JNF), which were established in the prewar period and changed little after the Revolution. These boards act as import agencies and supervise and regulate the domestic market, but they do not supplant the private trade.

State trading enterprises and exclusive marketing boards are generally incompatible with the Treaty of Rome, the charter of the EC, if they reduce the ability of firms to compete in EC markets. Rather than leave the matter to be tested in the courts, Portugal and the EC discussed the future of state agencies in the entry negotiations. As stipulated in Portugal's treaty of accession, these bodies will have to reduce substantially their role in the marketing of agricultural produce in Portugal. To conform with EC regulations, the three state enterprises will undergo a radical transformation of their trading powers and the three marketing boards will be eliminated by 1990. The transformation already has started, with the opening up to private firms of the import markets for oilseeds and sugar and the first steps toward a similar liberalization in the grain market. Accession to the EC has put a rigid timetable on such institutional development.

Cooperatives have played a significant role in the marketing of some agricultural products. In milk marketing and processing, they have come to dominate the industry, and they are essential in the implementation of milk policy. They produce and market a large share of domestic wine and are becoming more important in fruit and vegetable production and marketing. Since cooperatives operate in the middle ground between the state enterprises and the private firms, the degree of competition they face from private firms is a continuing issue. In particular, the present policy of granting exclusive collection rights to dairy cooperatives is likely to be challenged under the EC competition regulations. However, the setting up of cooperatives as nonexclusive trading entities is strongly favored by the operation of the CAP. Grants for starting coops are available from the EC, and several price support programs—such as withdrawal of fruit from the market—are instituted through cooperatives and producer groups in EC countries.

The most significant change in marketing institutions over the next decade, however, will likely be the expanded role for private firms. Under EC rules, most price supports are implemented through price incentives and disincentives for private firms. Import levies, storage subsidies, production aids, export refunds, and consumption aids are all paid by or to private firms in the marketing chain. Farmer and consumer prices thus are controlled only indirectly by these policy instruments rather than

being set directly by a parastatal agency. In the Portuguese system, private trade also has been controlled directly by public policy, as when price structures and marketing margins have been agreed to by the government and private firms or decreed by law. In the EC system, however, the relationship between public policy and private trade is much less direct. Adoption of the EC system introduces the possibility of greater flexibility in Portuguese prices, particularly with respect to regional price spreads, quality differentiation, and seasonal price patterns, all of which create incentives for private traders. Private firms in the EC enjoy greater freedom in agricultural marketing. The rewards for risk-taking, quality control, and market development are all likely to increase as Portugal adopts this marketing environment. The combination of liberalization of commercial practices and a greater role for private firms in policy implementation will change profoundly the nature of the food production and marketing industry in Portugal.

Output Price Policy

Few countries support their agricultural sectors uniformly across commodities. More commonly, a few farm products become the focal point of discussion on matters of farm price policy. Wheat fulfills the role of a key political commodity in Portugal. The significance of the wheat price lies in both its importance to consumers through bread prices and its influence on farming in the Alentejo. The Salazar regime attempted to keep consumers content by providing an adequate supply of bread at a fixed price and to mollify southern farm interests by supporting the producer price of wheat. In 1969 and 1971, the domestic wheat price was nearly 70 percent above the world price. Even though wheat output varied considerably with weather conditions, the Alentejo crop rotations were designed around wheat as the main source of income. By contrast, the prices of many other commodities were not supported at high levels, although imports were controlled and price levels fixed.

In the late 1960s, this pattern of policy support for wheat and for the agriculture of the South began to change. In response to interest by some foreign companies, the government helped establish a tomato-processing industry to produce tomato paste for export. This industry received an export subsidy in the early 1970s, a policy that was continued after the Revolution. Moreover, the regime began to address the problems of northern agriculture, long considered to be beyond hope of improvement, by establishing organized milk markets run by cooperatives. These local cooperatives received subsidies to set up local village milking parlors and improve milk collection. The policy was continued after 1974 and led to a rapid growth in milk production in the Northwest.

The 1974 Revolution, coinciding with high world wheat prices in 1973–75, gave rise to a different set of pressures on farm price policy. Holding down food prices became a dominant aim of price policy, and state trading agencies were used to subsidize imports of both wheat and animal feed ingredients. Producer prices were not allowed to rise to reflect scarcity in international markets; they stayed below world market levels until 1978. After that year, the degree of protection relative to world market prices rose steadily for wheat and other cereals. Although the real consumer prices of bread and cereals and oils and fats went down from 1974 to 1979, the prices for many other products—particularly meats, vegetables, and sugar—rose (Table 3.1). As a consequence, Portuguese agriculture began to concentrate on commodities with growing consumer demand and to take advantage of subsidized feedstuffs and fertilizer by intensifying production.

Portuguese price policy for agricultural products is now entering another phase—dictated largely by the CAP. Membership in the EC brings with it the acceptance of EC-determined policy prices for most commodities, subject only to limited national control over the level of the special exchange rate (the green rate) used to convert agricultural prices

TABLE 3.1. *Index of Consumer Prices for Food Products, 1963–83 (1963 = 100)*

Year	Bread and Cereal Products	Meat	Milk, Cheese, and Eggs	Oils and Fats	Vegetables and Fruits	Potatoes	Sugar
1963	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1964	97.0	108.7	101.3	102.0	100.2	79.2	101.9
1965	102.1	113.8	95.1	103.0	98.2	106.3	100.3
1966	100.7	113.1	105.8	101.9	120.2	138.9	99.0
1967	98.4	117.4	103.5	99.4	101.0	91.7	97.7
1968	95.6	111.8	102.9	98.2	108.1	78.4	95.7
1969	92.9	111.2	99.9	96.4	120.1	110.2	94.1
1970	89.1	111.8	96.4	100.9	115.2	84.9	93.3
1971	91.5	119.7	102.7	99.0	133.3	85.0	91.1
1972	87.6	121.1	99.8	94.4	134.9	116.4	86.4
1973	79.2	115.2	97.2	90.5	134.5	115.9	79.1
1974	82.9	111.9	89.6	108.9	119.5	108.5	73.5
1975	91.5	116.4	92.2	109.0	146.1	125.4	142.2
1976	77.5	133.8	106.0	91.0	153.3	146.5	120.5
1977	73.6	142.5	97.2	84.4	182.9	132.3	102.2
1978	66.4	127.9	93.5	75.6	146.8	69.9	89.9
1979	63.3	137.5	85.8	70.5	130.9	95.0	77.6
1980	72.3	155.5	86.7	76.6	130.2	97.0	87.6
1981	76.4	134.9	91.9	71.3	151.3	91.1	89.4
1982	83.0	136.6	98.2	86.8	155.5	106.7	88.0
1983	84.0	155.7	106.6	82.3	132.7	87.7	86.0

SOURCES: Instituto Nacional de Estatística (INE), *Estatísticas Agrícolas* (Lisbon), various years, *Anuarios Estatísticos*, and PES team estimates.

from the unit in which the CAP policy prices are set (the European currency unit, or ECU) into national currency. Moreover, although each member country has a say on common price decisions in the EC Council of Ministers, this national influence is limited in a community of twelve member states. Therefore, the trend in real farm prices, under national control in normal circumstances, becomes largely exogenous for member countries.

The trend in future CAP prices will be determined by broad considerations relating to market balance in the EC, world market trends, budgets, and general macroeconomic conditions. The strong presumption is that real output prices in the EC will tend to decline over the next decade. Hence, in Portugal, real prices will come down, except possibly for some commodities whose prices at entry were low relative to those of the EC. Portuguese real prices have fluctuated widely in the past, as is shown in Table 3.2. EC membership thus could stabilize real prices around a declining trend. The outlook for prices under the CAP is discussed more fully later in this chapter.

Input Price Policy

Input price subsidies, particularly for fertilizer and mixed feed, became a significant aspect of Portuguese agricultural policy in the 1960s. The objective was to intensify agricultural production and to shift that production to commodities for which demand was rapidly expanding, notably meat and dairy products. The fertilizer price was held at roughly one-half of the actual production cost as a result of subsidies to the major producing firms. Animal feed ingredients, imported by parastatal agencies under the Salazar regime, were sold at prices that often were lower than their costs. The subsidies were paid from the National Supply Fund, an adjunct to the regular government treasury that received income from taxes on imports of oil.

After the Revolution, the practice of subsidizing inputs to crop and livestock farmers continued. The policy became increasingly expensive, and the Supply Fund began to require subventions from the regular budget to continue its activities. These policies were modified in June 1983, largely in response to the need to curb public spending. While in operation, the policies heavily influenced the farming pattern but benefited some types of agriculture more than others. The sudden removal of input subsidies thus raised short-term problems of differential impact on various sectors.

Input subsidy policies are not in general an instrument of the CAP, and national policies of this type are contrary to competition regulations in the EC. Therefore, markets for seed, fertilizers, and inputs to the mixed-feed

TABLE 3.2. *Index of Producer Prices of Agricultural Products, 1963–83 (1963 = 100)*[a]

Year	Wheat	Rye	Maize	Rice	Oats	Barley	Potatoes	Tomatoes	Sunflowers	Olive Oil	Wine	Beef	Pork	Class A Milk
1963	100.0	100.0	100.0	100.0	100.0	100.0	100.0	n.a.	n.a.	100.0	100.0	100.0	100.0	n.a.
1964	99.0	99.4	97.6	104.7	102.6	100.6	84.4	n.a.	n.a.	99.0	99.0	109.2	120.4	n.a.
1965	103.2	102.0	117.6	103.4	112.9	107.2	142.1	n.a.	n.a.	113.0	94.1	104.9	106.1	n.a.
1966	100.0	102.2	107.2	106.5	116.0	104.0	161.8	n.a.	n.a.	108.8	124.3	115.2	109.8	n.a.
1967	96.4	98.6	100.9	106.5	94.6	102.1	87.7	n.a.	n.a.	105.0	161.3	119.3	116.7	100.0
1968	92.3	96.6	97.8	108.4	70.6	74.6	92.2	n.a.	n.a.	110.3	145.1	114.2	87.8	95.7
1969	89.2	94.8	93.4	107.1	78.5	83.0	122.9	100.0	n.a.	106.6	184.6	112.2	91.5	92.6
1970	86.4	91.8	87.1	106.0	82.6	83.0	87.0	100.3	100.0	103.2	157.8	113.7	111.3	89.6
1971	91.8	90.3	100.7	105.7	82.1	78.4	109.4	103.1	102.8	100.8	183.7	129.1	110.2	106.9
1972	87.1	85.9	95.4	95.8	74.1	73.8	139.8	99.4	113.3	108.8	206.9	132.0	104.2	104.5
1973	78.4	77.9	81.2	86.2	71.3	74.9	140.3	101.2	105.5	125.0	217.1	161.0	100.9	95.1
1974	73.1	72.7	93.5	93.1	66.8	73.3	134.3	164.1	117.9	168.4	128.6	144.3	96.7	99.7
1975	75.0	81.6	114.4	101.1	68.0	69.6	174.7	142.3	120.3	172.5	132.0	146.0	96.4	122.5
1976	62.9	69.9	95.7	93.7	66.3	59.3	212.0	115.1	101.1	160.6	144.1	147.5	122.7	120.3
1977	59.8	64.6	88.6	78.6	82.4	76.3	163.0	96.5	95.8	144.7	203.3	152.3	86.4	107.1
1978	57.1	64.3	76.4	81.0	106.5	85.3	87.5	87.0	91.2	110.2	313.6	133.9	69.0	115.1
1979	65.1	54.3	67.8	79.7	72.5	62.6	141.3	86.3	84.0	122.0	124.3	143.6	104.5	99.6
1980	70.0	69.4	73.7	89.4	62.3	55.7	115.8	107.1	91.1	122.4	135.2	161.1	81.4	93.5
1981	65.8	79.7	80.4	88.2	68.7	71.9	133.4	99.7	82.1	138.6	183.3	131.7	57.0	85.7
1982	67.5	78.0	79.8	89.3	65.7	64.7	142.9	111.8	84.9	137.9	136.7	122.7	78.6	90.3
1983	71.6	83.5	100.3	93.9	68.6	68.4	134.5	108.6	83.4	145.8	124.9	147.4	84.8	89.3

SOURCES: Instituto Nacional de Estatística (INE), *Estatísticas agrícolas* (Lisbon), various years; *Anuarios Estatísticos*; and PES team estimates.

[a]Or first year of series.

n.a. = not available.

Average prices to producers, with the exception of milk prices, which are guaranteed prices for the organized zones, 3.5 percent fat content.

industry will be liberalized. The development of a competitive input supply market should provide technical services to farmers to a greater extent than at present. Except for feed ingredients covered by the CAP, imported inputs will come in without government price control, subject only to the EC's Common Customs Tariff (CCT) on third-country trade and to the arrangements for the transition period. They will be priced essentially at European levels both to the farmer and to the country (since CCT revenues are also part of EC finances). The scope for modifying price signals to encourage or discourage the use of certain inputs will no longer exist.

This lack of Portuguese control over future farm input prices will put additional pressure on Portuguese policies. Production technologies will have to adjust to changing relative costs of inputs. Specific policies to facilitate these adjustments will be an important part of the process of technical adaptation.

Trade Policy

Trade policy in agricultural products is an adjunct to domestic farm policy. In Portugal, a major goal of trade policy has been to raise domestic prices by controlling the flow of imports, often purchased exclusively by state agencies. Until June 1983, important exceptions to this tendency toward high prices were feedstuffs, where the supply of low-cost compound feeds dominated the desire to grow domestic forages, and wheat, where the aim was lower bread prices.

Trade patterns in agricultural products have been related closely to income growth and agricultural stagnation. Exports of agricultural products have dropped from nearly 50 percent of total exports in the mid-1950s to about 20 percent in 1985. Wood products (including cork) and fisheries products, together with wine and tomato paste, account for a large part of those exports. Imports of agricultural products increased rapidly in the early 1970s, rising from 20 percent of total imports in 1970 to 27 percent in 1975—despite an increase in the cost of oil imports in the same period. Since 1975, the share of agricultural imports in total imports has resumed its historical downward trend. The major imported commodities have been corn, oilseeds, wheat, sugar, and cotton. Imports of meat and dairy products have been less prominent, reflecting the policy of importing animal feed and subsidizing its use in the domestic livestock sector.

Trade policy in agricultural products did not change markedly with the 1974 Revolution. The objective of keeping food prices down was met by subsidization of imports of cereals and oilseeds; exports of tomato paste, cork, and wine brought in needed foreign exchange. In addition, negotiation with the EC on eventual accession was started within three years of

the Revolution, influencing the direction of trade policy in the agricultural and other sectors of the economy.

With EC accession, a different type of agricultural trade policy will be needed—still geared to domestic EC policy but employing different instruments and involving a new mix of institutions. Trade will have to be conducted by private firms, subject to levies on imports and assisted by subsidies for exports. The internal market prices will reflect such private trading opportunities. Trade in input items will be liberalized.

Trade patterns take on an added importance in the context of EC accession. EC trade policy discriminates according to the CAP principle of "community preference" against nonmembers, imposing a hierarchy of trade restrictions. The future pattern of trade influences Portugal's expected payments to the EC. Changes in trade policy, specifically the liberalization of trade with the EC, including Spain, is likely to cause shifts in the recent trade pattern. These changes could affect exporting regions such as the Azores. They could also affect Portugal's agricultural processing and marketing industry. Trade with Spain is a particularly sensitive issue, and the relaxation of controls during the transition period could initiate trade flows in both directions. For sensitive commodities, a monitoring system has been set up to allow Portugal and the EC countries to regulate rapid changes in trade flows during the transition period. It is also likely that there will be some reorientation of Portuguese exports as market access in Europe changes. Finally, transition arrangements explicitly require certain changes in trade flows (for example, an increasing minimum share of grain imports has to come from the EC).

The liberalization of agricultural trade—increased participation in importing by private firms, greater involvement in domestic markets by private firms, relaxed price and margin controls, and the use of the private sector for policy implementation—could have a significant impact on trade patterns and levels. In effect, the loss of the ability to discriminate between domestic and other EC sources of supply (except for health reasons or as part of the transition mechanism), together with the reduced role of the parastatal agencies in trade, will open up the Portuguese market to a much wider range of products. In turn, Portuguese products will find easier access to other markets in Europe. This prospect places a much higher premium on the ability to grade, prepare, label, pack, and advertise farm products at home and abroad. Public and private investment and organizational skills will be required to meet this challenge.

Public Investment Policy

The provision by the public sector of capital inputs for agriculture includes electricity, roads, irrigation schemes, and training and extension

services. These investments facilitate private investment activities; they also allow for planned changes in regional activity and influence income distribution. Public investments in agriculture are carried out by the Ministry of Agriculture, the Ministry of Public Works, the Ministry of Energy, the local authorities, and other government agencies. Efforts to coordinate the various investment activities are made by the Comissões de Coordenação Regional (CCRs). These regional coordinating committees work with the regional arms of the central government and with the municipalities. There is no clear-cut allocation of decisionmaking authority between the central ministries and the local authorities. Central government agencies provide major investments, such as large-scale dams, main roads, and the long-distance electricity grid; local authorities provide and maintain feeder roads, low-voltage electricity lines, and other local extensions of the national systems. The Ministry of Agriculture provides extension and training services as well as the agricultural component of water-management systems, such as irrigation ditches. The funds of local authorities, from local taxes and license fees and from a transfer of central funds, are also used in part for public investment.

Because of the rapid rise in government outlays for price supports and input subsidies, the allocation of public funds to agricultural investment has lagged in recent years. Table 3.3 contains the development and investment budgets for agriculture for the years 1980 through 1983. The development budget did not grow during that period. Agricultural spending increased (in current escudos) when allocations to the fisheries sector were cut back in 1981 but lost ground to both fisheries and inflation in 1983. The dominance of a relatively small number of large public works

TABLE 3.3. *Agricultural Development and Investment Budgets, 1980–83 (in Million of Contos)*[a]

Budget	1980	1981	1982	1983
Development[b]				
Agriculture	5,564	7,096	7,626	4,660
Fisheries	3,148	45	37	3,007
Marketing	450	339	487	186
Research	234	240	140	480
Total	9,396	7,720	8,290	8,333
Investment[c]				
Agriculture	1,470	2,881	5,724	7,272
Marketing	272	301	532	630
Research	709	51	567	413
Total	2,451	3,233	6,823	8,315

SOURCES: World Bank Agricultural Sector Survey and PES team estimates.

[a]A conto equals 1,000 escudos. In 1983, the average exchange rate for escudos and dollars was Esc 106 per $US 1; therefore 1 conto was $US 9.43.

[b]Programa de Investimento e Despesas de Desenvolvimento da Administração Central (PIDDAC).

[c]Programa de Investimentos do Sector Empresarial do Estado (PISEE).

projects, such as irrigation systems, relative to marketing and research spending is an issue that will become more critical in light of EC accession. The investment budget of the state enterprises has shown a tendency to rise, mainly as a result of EPAC investment.

Public investment policy is destined to undergo rapid change as a result of the recent EC accession. EC member states have argued that Portuguese agriculture will require a larger injection of investment funds if it is to develop its potential and compete with the farm sectors in other member countries. Under EC regulations, such investment cannot be stimulated through price levels higher than those in other EC countries; instead it must come through subsidies to private investors or through public investment activities. The EC thus has allocated 700 million ECUs over a ten-year period, 1986–96, to be matched with Portuguese investment funds and dispensed under a special development program for agriculture. This Specific Fund will increase significantly capital spending on project-related investment by the central government. The issue of the distribution of the funds is one of the key questions for Portuguese policy.

Such investment decisions have a close link with factor market policy, discussed in the next chapter. Public investment, government grants for private investment, interest rate subsidies, and land and labor market policies are often discussed together as structural policies. The EC provides some structural support from the guidance section of its Farm Fund as well as from its Social and Regional funds, but it has not developed significant policies to control, direct, or improve the working of land, capital, and labor markets in rural areas. Such policies remain largely the province of national governments, although national policies in these areas too have to observe general EC rules on competition and particular regulations on structural policies.

Portugal and the EC

Portugal applied to join the EC in March 1977. The application was seen, within and outside Portugal, as a means of strengthening the democratic process initiated in 1974 and as an affirmation of the desire to modernize the economic system. The move was welcomed by EC members, and negotiations opened in October 1978. Portugal, as a member of the European Free Trade Association (EFTA), had experienced a degree of integration with other European countries through industrial tariff reductions. A treaty that Portugal signed with the EC in 1972 envisaged the dismantling, by 1985, of trade barriers limiting Portugal-EC trade in industrial products. But membership in the EC was recognized as involving much more than free trade in manufactures.

As a major trading bloc, the EC has considerable clout in global com-

mercial and monetary discussions. As a political entity, it increasingly has been coordinating its members' approaches in international affairs, with regular consultations among foreign ministers being seen, particularly by the smaller members, as a way to influence world affairs. Because EC membership is restricted essentially to European democracies, accession reinforces the commitment to this political system in Portugal.

Although it is neither a unified market stripped of national barriers nor a supernational federation of states, the EC impinges on many aspects of commerce and policymaking for each of its members. Funds are available to support EC initiatives in social and regional affairs and in general economic development. Extensive monetary cooperation has evolved among members states, with the European Monetary System (EMS) for exchange rate stabilization and the ECU for accounting transactions. The Treaty of Rome (1957) specifies rules of competition, grants the right of business establishment in all parts of the EC, and mandates liberal capital and labor movement. Commercial arrangements with third countries are handled largely at the EC level and include the Lomé Agreement with many developing countries and treaties of association with most countries in the Mediterranean basin. Membership therefore touches all aspects of economic and political life for those who join. For Portugal, in particular, this degree of interdependence with other European countries will be a major new departure.

The EC has a well-defined enlargement process, used first in the accession of Denmark, Ireland, and the United Kingdom, in 1973, and later in the entry of Greece, in 1981. This process is designed to minimize disruption of the existing community. In effect, each new member has to adopt the *acquis communautaire*—the accumulated regulations and practices of the EC—irrespective of the member's views on their appropriateness. Following this principle, negotiations are technical discussions on the minor changes needed in EC instruments to incorporate the new member and on other changes, often major ones, required in the member's laws to adopt EC regulations. There is, of course, some give-and-take, arising from political discussions, which can override the technicalities. But the one-sided nature of the negotiations is accepted by all parties. Once membership has been achived, the new member can use its position within the EC to modify rules and regulations; as an outsider, it has no such power.

In the Portugal-EC negotiations, agreement was reached on the terms of accession in mid-1985. The treaty was then ratified by each member's parliament. Portugal entered the EC on January 1, 1986.

Policy and Price Transition

Following accession, policies pursued by Portugal toward the agricultural sector will be constrained by the operation of the CAP. A transi-

tion period of up to ten years, designed to ease adjustment in commodity markets, will determine the harmonization of prices and policies. During this period, funds will be available from the EC to assist in the structural adjustment of Portuguese production and marketing processes. Several aspects of the present marketing structure will be modified to accord with EC rules, in addition to the harmonization of prices.

Two types of transition have been negotiated for the harmonization of Portuguese agricultural prices and policies. The first is a classic transition, lasting seven years, to be applied to products for which there is no Portuguese production or for which no problems exist in the modification of present marketing arrangements. Sugar, oils and fats, processed fruits and vegetables, sheep and goat meat, and a number of minor products will follow this classic transition to harmonized prices. An accession compensatory amount (ACA) will be levied on trade into and out of Portugal to maintain the price difference appropriate to the year of transition. If Portuguese prices are above those in the EC, the ACA will act as a tax on imports and a subsidy for exports. If Portuguese prices are below EC prices, the ACA will act as a subsidy for imports and a tax on exports. The subsidies will be paid to Portugal from EC funds, and the taxes will be paid by Portugal into the EC coffers.

The second type of transition will be used for all commodities for which significant changes in marketing practices or institutions will be needed before Portugal can operate the mechanisms of the CAP. A two-stage transition, it will allow for a first stage, of up to five years, during which marketing improvements can be undertaken. Funds are available for this purpose as part of the EC structural program. Price harmonization is generally not required in this stage. No payments of levies to the EC need to be made, and export subsidies will be financed by the Portuguese government rather than by the EC. During the second five-year stage, the price harmonization will continue much as it would under a classic transition. ACAs will be defined and payments will be made to and by the EC in the same way as with single-stage commodities. Two-stage products include milk and milk products, cereals, rice, fresh fruits and vegetables, wine, beef, pork, poultry, and eggs. All the commodities analyzed in this book, except sugar, melons, and tomatoes for processing, will be subject to the two-stage type of transition.

Price Harmonization

The transition period defines the time-path of price harmonization. Portugal's treaty of accession specifies constraints on the path of price harmonization depending on the relationship between EC and Portuguese prices at the date of accession and the type of transition arrangement. For two-stage products whose Portuguese price is above that of the EC, the price rise in escudos during the first transition phase must not

increase the Portuguese price expressed in ECUs—even if the ECU price in the EC increases in that period. This restriction is designed to narrow the gap that must be phased out during the second transition stage. If the CAP price is reduced during the first phase, the Portuguese price (in ECUs) has to be reduced equally. In the event that the CAP price reaches the Portuguese price during the first stage, it establishes the Portuguese price. Any gaps that remain at the end of the first stage are phased out in five equal steps in the second stage.

For classical commodities whose Portuguese price before accession is less than the EC price (no classical commodities have prices above the EC price), the price rise in escudos has to take into account both a transition step and any rise in ECUs in the rest of the EC. If no significant difference in price levels exists at the time of entry, the price harmonization can take place at once.

The process of harmonization affects the Portuguese price structure in a number of ways. The prices of commodities at the wholesale level are likely to change with the adoption of the CAP. This policy operates in general at the wholesale point by influencing either the cost of imported commodities that compete with domestic output or the price of surplus products through intervention buying or export subsidization. For example, the prices of wheat, corn, dairy, oilseed, beef, pork, lamb, and poultry products will all be constrained by the availability of foreign supplies in the main consumption areas. The costs of these imports will be influenced directly by the threshold prices (if imports come from third countries) or by the market prices in other EC member countries (if imports originate there).

To predict wholesale price levels in Portuguese markets, the following assumptions are used in this study. For commodities presently in surplus in the EC (wheat, beef, and dairy products), the Portuguese import price will be the EC intervention price plus transport costs from major EC ports and unloading costs in Portugal. For commodities currently in deficit in the EC (corn, lamb, and oilseeds) and for those with irregular export supplies (pork and poultry), the dominant price will be the threshold, or border, price as set under EC rules, again including unloading costs. These support prices put a floor under Portuguese wholesale prices and act as the main price support mechanism. Portuguese price levels could rise above these support levels only if world prices were to rise rapidly.

Farm prices of grains are assumed to be influenced directly by support mechanisms in the wholesale markets. The farm-level price is set equal to the wholesale price minus a transportation margin. The CAP regime for oilseeds works through subsidies paid to crushers in order to encourage the purchase of domestic production and to allow crushers to offer a higher price to farmers. The subsidy is designed to assure the target price at the farm level while permitting purchases from world markets to fill

residual domestic needs. Consequently, it is assumed in this study that producer prices will move to the CAP target price level and that imports will be liberalized. For beef and lamb, there are assumed to be fixed intervention prices at which the intervention agency will buy carcasses. Usually, market prices for better qualities of meat will be above these floor prices.

The change in wholesale prices is expected to trigger price changes at other levels of the marketing chain. The aim of the CAP is to influence farm-level prices through support of the wholesale market. Currently, the farm-level prices of grains, oilseeds, and milk are supported in Portugal through the buying policies of EPAC and IAPO and through the mediation of the dairy cooperatives and their unions. Assumptions about the future price structure must take into account the marketing system changes that are likely to accompany price movements.

It is assumed that the cooperatives in the milk sector will continue to pay a uniform price to farmers for raw milk, even though the CAP has no mechanism to ensure this outcome. The relationship between wholesale prices and other prices in the marketing chain will depend on competitive conditions and government regulations in the marketing chain. One might, for instance, assume that noncompetitive elements in the marketing sector could capture gains arising from higher wholesale prices and pass down to farmers losses arising from wholesale price decreases. Alternatively, intense competition among marketing firms could keep margins steady and pass all gains to farmers. Rather than prejudging the degree of competition in the absence of detailed information about future structural changes, it was decided to use a relatively neutral assumption. Percentage margins were assumed to be constant in the absence of other information, implying that prices will change in the same proportion at different levels in the marketing chain. A wholesale price change of 5 percent is thus assumed to imply a 5 percent change in all other related prices in the system.

The Price Gap at Entry

The ratios of Portuguese to EC price levels for each commodity have varied over time. Portuguese price levels in 1978 were somewhat lower than those of the EC. The reduction of real prices in the EC combined with the appreciation of the real escudo relative to the ECU (that is, a depreciation of the nominal escudo slower than inflation differences) led to an increase in the ratio; subsequent Portuguese prices were thus generally above those in the EC. This shift was accentuated by Portugal's decision to raise support prices following the removal of subsidies in 1983 and by a rise in the real escudo-ECU rate in 1984. Hence, accession brings the prospect of real price declines for several commodities.

Levels of CAP and Portuguese prices at entry give an indication of the

likely direction of price changes implied by membership. Table 3.4 shows the Portuguese and EC prices for the commodities covered in this study in 1984–85 and 1985–86. The assumption has been made that future prices will follow a moderate path, not fully compensating any member state for inflation experienced in the past year.

The harmonization of prices is toward EC levels translated at green rates. The actual level of prices obtaining in Portugal at any given time is thus dependent on the green rate in force. The initial green rate was fixed on March 1, 1986, at the prevailing market rate between the escudo and the ECU, and this green rate will be applied to all the prices for the marketing year 1986–87. For convenience, it is assumed that in later years the green rate will be determined at the start of each calendar year but will not apply until the start of each marketing year during that calendar year. The market exchange rate from which this green rate is derived is one that is assumed to just offset inflation differentials since 1983—that is, a constant real exchange rate for the escudo against the ECU.

Portugal will have some limited flexibility in influencing how fast the green rate adjusts to the escudo's market rate of exchange with the ECU. Portugal could choose to enjoy some EC-financed import subsidies on the major grain and livestock imports (from both the EC and third countries) by delaying the depreciation of its agricultural rate of exchange. The assumption has been made that any new divergence between green and market rates will be removed within the two following marketing years—the informal agreement that members of the EMS are supposed to follow in similar circumstances. Under this assumption, any new import subsidies that arise will be phased out within two years.

Future CAP Prices

The level and direction of movement of real CAP prices over the decade will have a more enduring impact on Portuguese agriculture than will the price adjustments required over the transition to close the price gap. EC prices are a compromise among member countries with differing attitudes and economic situations. They reflect, in particular, the great political difficulty experienced in the EC of reducing nominal prices, even of commodities in significant surplus. The moderate price policy espoused by the EC Commission for many years and reluctantly agreed to by member countries involves using inflation to reduce somewhat the effective purchasing power of agricultural products.

The modernization and intensification of EC agriculture, however, has led to greater output—even in the face of gradually declining real prices. Moreover, manipulation by member countries of the green rates of exchange has meant that in some countries real prices have risen for limited

TABLE 3.4. *EC and Portuguese Support Price Levels, 1984–85 and 1985–86 (in ECUs per Metric ton)*

Commodity	1984–85			1985–86		
	EC	Portugal	Percent	EC	Portugal	Percent
Wheat	182.73	291.18	159.3	179.44	295.62	164.7
Wheat flour	382.42	347.50	90.9	376.68	388.72	103.2
Barley	182.73	256.07	140.1	179.44	266.42	148.5
Maize	182.73	274.05	150.0	179.44	281.02	156.6
Rice	314.19	345.88	110.1	320.47	341.43	106.5
Milk, mainland	274.30	353.76	129.0	278.40	381.66	137.1
Butter, mainland	3,197.00	3,162.57	98.9	3,132.00	4,188.72	133.7
Skim milk powder, mainland	1,658.80	3,618.16	218.1	1,740.40	3,753.74	215.7
Milk, Azores	274.30	250.53	91.3	278.40	260.83	93.7
Butter, Azores	3,197.00	2,899.39	90.7	3,132.00	3,959.79	126.4
Skim milk powder, Azores	1,658.80	3,027.66	182.5	1,740.40	2,879.96	165.5
Beef	3,439.30	3,282.00	95.4	3,439.30	3,391.25	98.6
Sheep	4,280.40	4,280.30	100.0	4,280.40	4,280.51	100.0
Poultry	1,966.84	1,764.60	89.7	1,892.93	1,974.03	104.3
Tomatoes	100.20	56.85	56.7	97.19	53.88	55.4
Wine	3,170.00	2,060.00	65.0	3,170.00	2,060.00	65.0
Sugar, refined	534.70	663.68	124.1	547.80	742.40	135.5
Olive oil	2,276.20	2,034.61	89.4	2,276.20	2,034.61	89.4
Sunflowers	582.20	481.95	82.8	573.50	564.57	98.4

SOURCE: PES team estimates.

periods. These forces have exacerbated the problems of financing the EC agricultural spending and intensified efforts to control it. The central issue, for present purposes, is whether real prices will be cut enough in the future to contain budget costs or whether more funds will be found to enable present price levels to be maintained. It is assumed, for the purpose of projecting future CAP prices, that there will be continued real decreases in agricultural prices in the major member countries over the projection period. The implications of this assumption are discussed further in chapter 12.

The projections of future EC prices and the exchange rates necessary to translate CAP prices into Portuguese currency involve the following steps: projection of inflation rates for the United States, for long-standing EC members, and for new entrants (Portugal and Spain); projection of exchange rates vis-à-vis the dollar for EC members, new entrants, and the ECU, on the assumption of no change in real exchange rates; projection of market exchange rates for the ECU and of green rates, assuming a two-period lag in adjusting to market rates; and calculation of EC price changes under the CAP, which will give no real price increase in any country.

Table 3.5 summarizes the projections of Portuguese exchange rates for the ECU and Portuguese inflation rates to 1996. If one assumes that inflation will be about 3.5 percent in the strong-currency member countries, price rises in ECUs of about 3.5 percent can be accommodated

TABLE 3.5. *Exchange Rate and Inflation Assumptions in Price Projections, 1984–96*

Year	Portuguese Inflation Rate (Percent)	Escudo/ECU Market Rate	Escudo/Green ECU	
			Market Rate	Green Rate
1984	28.92	108.84	—	—
1985	25.00	119.65	—	—
1986	20.00	142.00	150.44	153.85
1987	19.00	161.28	175.22	166.30
1988	18.00	180.83	201.29	191.91
1989	17.00	201.22	229.30	219.17
1990	16.00	222.19	259.00	248.21
1991	16.00	243.44	290.09	278.94
1992	16.00	266.90	324.91	312.46
1993	16.00	292.81	363.92	350.01
1994	16.00	321.45	407.63	392.09
1995	16.00	353.09	456.59	439.22
1996	16.00	388.08	511.44	492.04

SOURCE: PES team estimates.
— = not applicable.

without overcompensating for inflation in any member country. Similarly a zero ECU price increase will translate into a zero nominal price increase in these strong-currency countries. It is likely that for the commodities in surplus, which include grains and dairy products, the price changes will be kept to the lower end of this range. The result will be to put downward pressure over time on most real prices for agricultural commodities in the EC as a whole.

Implications for Portuguese Prices

The projections of CAP price trends and of exchange rates for the escudo give an indication of the CAP price with which Portuguese prices will have to harmonize during the transition period. Table 3.6 shows the projected trends in real prices for selected commodities in Portugal, assuming where appropriate a five-year price-adjustment period beginning in 1991 (the onset of the second stage of the transition), during which the price gap between the EC and Portugal will be reduced in five equal steps. At the end of the transition period, however, the price level in Portugal will remain somewhat below the full EC price converted at market exchange rates as a result of the lagged adjustment of green rates.

The intention of the transition period is to allow for a smooth adjustment of nominal prices so as not to cause too rapid changes in private profitability. Unfortunately, the process does not guarantee a smooth trend in real prices. For several major commodities, real prices will fall. But some commodities will suffer a rapid decline in deflated prices at the early stages of the transition period.

Conclusion

Several important conclusions for the evolution of Portuguese prices emerge from the discussion in this chapter. The rapid rise of real prices in 1981–83 has left the Portuguese prices of some commodities at the time of entry into the EC well above EC levels and hence has complicated the process of harmonization from those levels. The expected fall in EC real price levels during the transition decade accentuates the required downward trend in Portuguese price levels. A Portuguese decision to force green rates to lag behind market rates would tend to cause a sharp decline in real prices early in the transition period. A smooth transition of nominal prices would cause sharp changes in real prices and hence short-term difficulties for particular sectors. Cereal and dairy sectors are likely to suffer the most serious declines in real prices, both because they have benefited most from recent Portuguese price increases and because they

TABLE 3.6. *Projected Real Prices for Agricultural Products, 1983–84 to 1996–97 (1983 Escudos per Kilogram)*

Market Year	Wheat	Wheat Flour	Corn	Barley	Rice	Corn (Selling)	Wheat (Selling)	Milk	Butter	Skim Milk Powder	Cheese	Milk (Azores)	Skim Milk Powder (Azores)	Butter (Azores)	Cheese (Azores)
1983–84	23.00	22.00	23.00	19.50	22.32	13.80	16.40	26.46	248.00	277.00	378.00	18.74	231.79	227.37	378.00
1984–85	25.75	30.73	24.23	22.64	30.59	17.10	23.50	31.28	279.67	319.96	396.42	22.15	267.74	256.40	396.42
1985–86	23.37	30.73	22.22	21.06	26.99	21.70	21.41	30.17	331.14	296.75	370.73	20.62	267.74	256.40	396.42
1986–87	22.56	29.66	21.44	20.33	26.05	21.10	21.25	29.12	319.61	286.42	367.56	21.77	227.67	313.04	370.73
1987–88	20.32	26.72	19.32	18.31	23.47	19.09	19.45	26.23	287.90	258.00	331.09	20.10	219.75	302.14	367.56
1988–89	19.70	25.91	18.73	17.76	22.76	18.59	19.16	25.44	279.19	250.20	321.08	19.98	197.95	272.17	331.09
1989–90	19.07	25.08	18.13	17.19	22.38	18.05	18.76	24.62	270.21	242.15	310.75	19.82	191.96	263.93	321.08
1990–91	18.46	24.27	17.55	16.64	22.09	17.51	18.33	23.83	261.54	234.38	300.78	19.67	185.78	255.44	310.75
1991–92	18.95	23.87	20.58	17.47	23.92	16.20	16.95	22.49	258.41	213.75	281.38	19.53	179.82	247.25	300.78
1992–93	17.05	23.79	18.34	15.97	24.39	14.44	15.05	20.93	243.74	179.70	263.81	19.33	209.75	248.41	281.38
1993–94	15.55	23.94	16.51	14.77	24.87	13.00	13.55	19.67	232.55	149.31	249.60	19.13	175.70	233.74	263.81
1994–95	14.83	24.05	15.62	14.23	25.33	12.30	12.83	18.96	227.33	130.69	238.13	18.94	145.31	222.55	249.60
1995–96	14.83	24.00	15.62	14.30	25.79	12.30	12.83	18.75	225.31	123.41	228.89	18.75	126.69	217.33	238.13
1996–97	14.96	23.79	15.77	14.42	26.25	12.42	12.96	18.56	223.31	121.79	221.43	18.56	119.41	215.31	228.89

Market Year	Beef	Lamb	Poultry	Tomatoes	Wine[a]	Sugar Beets	White Sugar	Potatoes	Melon	Sunflowers
1983–84	330.88	360.00	156.00	5.20	182.17	4.48	58.69	15.00	17.30	35.00
1984–85	290.23	378.52	156.00	5.03	182.17	3.62	58.69	15.00	17.30	42.62
1985–86	268.09	338.38	156.00	4.26	162.85	3.23	58.69	15.00	17.30	44.63
1986–87	258.76	333.13	148.72	4.65	168.14	3.18	55.62	15.00	17.30	38.74
1987–88	237.75	306.09	138.70	4.69	161.59	2.92	49.11	15.00	17.30	36.36
1988–89	235.17	302.76	139.38	5.05	166.79	2.89	46.61	15.00	17.30	37.03
1989–90	232.16	298.89	139.77	5.38	171.44	2.86	44.07	15.00	17.30	37.80
1990–91	229.20	295.08	140.16	5.71	175.90	2.82	41.60	15.00	17.30	38.50
1991–92	248.06	291.60	138.99	6.02	209.68	2.79	39.21	15.00	17.30	38.69
1992–93	246.17	287.20	136.55	6.30	205.52	2.74	36.76	15.00	17.30	38.61
1993–94	251.62	282.91	134.75	6.18	201.44	2.70	36.21	15.00	17.30	38.31
1994–95	257.94	278.66	134.49	6.05	197.45	2.66	35.66	15.00	17.30	37.85
1995–96	264.28	274.49	135.67	5.93	193.54	2.62	35.13	15.00	17.30	38.13
1996–97	268.98	270.38	137.03	5.82	189.71	2.58	34.60	15.00	17.30	37.57

SOURCE: PES team estimates.
[a]Wine prices are expressed in Escudos per degree hectolitre.

produce the commodities in chronic surplus in the EC. Livestock producers (except dairy) and tomato and sunflower growers seem likely to experience eventual real price gains from membership, although pork, poultry, and beef producers will suffer a short-term initial decline in real prices. The implications of these price changes for agricultural system profits are discussed in the next two parts of the book.

4. Agricultural Factor Markets

by Eric Monke

This chapter describes the markets for labor, capital, and land in Portuguese agriculture and justifies the particular factor prices used in the analysis of private and social profitability later in the book. Market prices for labor and land are readily observable, and private rates of return on investment can be calculated from capital stock and factor income data. But estimation of social prices is a more difficult exercise. Given sufficient information, social prices would be calculated from a general equilibrium model, in which world prices for tradable outputs and intermediate inputs would be used to determine domestic factor prices. Policies (and market failures) would be revealed as the instruments that cause private prices to differ from their social opportunity costs.

The approach used here is less direct. Social prices for factors are determined instead as residuals between private market prices and the effects of policies. The first three sections of the chapter use this analytical strategy for the labor, capital, and land markets. The strategy is particularly helpful in assessments of the impacts of factor market policies on factor market prices. The indirect effects of policies on factor prices—distortions in the output markets and intermediate input markets and the cross-effects of factor market policies—can be considered only qualitatively. As a result, profitability analysis must emphasize sensitivity of the results to changes in the factor price estimates.

The fourth section of the chapter projects factor prices for the 1986–96 transition period. The labor and capital markets are linked across the agricultural and nonagricultural sectors. Agriculture's share of total labor and capital supplies is relatively modest, and these factor prices can be considered exogenous with respect to developments in the agricultural sector. The presence of integrated labor and capital markets complicates the projections because their factor price changes will be influenced by the economywide pattern of investment and trade flows that results from EC membership and by the conduct of domestic factor market policies. Specific changes in agricultural commodity policies will have their principal impact on land prices.

A further complication arises because EC member countries retain substantial autonomy in factor market policies and guesses about domes-

tic policy responses to EC accession are hazardous at best. In Portugal, capital markets are the most important factor markets in this regard. Credit controls have been the primary instrument to limit inflation, and future use of these controls could continue the substantial distortions already present in the credit markets.

Labor

Daily wage rates for adult labor in agriculture are provided in Table 4.1. Reported wages are higher in the northern and central regions than in the southern regions for most years, but the data exclude social security payments by employers (24 percent), which are more prevalent in the southern and central regions. Although the data reflect only modal values and relative regional wage rates show some variation over time, the differences are not large compared to the likely costs of migration. The labor market appears to be reasonably well integrated in a spatial sense.

TABLE 4.1. *Agricultural Wage Rates, 1965–83 (in Escudos per Day)*

Year	Adult Women[a]	Adult Men[a]	Adult Men		
			Southern Regions[b]	Northern Regions[c]	Central Regions[d]
1965	21.6	35.8	30.8	34.3	37.8
1966	24.8	41.7	36.0	39.5	43.9
1967	27.3	45.7	40.7	43.5	48.0
1968	31.7	54.2	48.1	51.5	58.5
1969	34.8	59.1	52.8	59.1	61.0
1970	38.2	66.2	58.8	67.9	68.1
1971	44.6	74.7	68.9	75.4	75.7
1972	49.0	83.6	78.6	82.6	84.6
1973	56.0	94.3	89.1	93.8	94.4
1974	77.1	123.0	125.0	118.9	116.6
1975	115.3	152.0	161.6	139.3	143.4
1976	115.3	175.0	174.5	161.4	170.6
1977	141.0	201.1	187.0	188.4	199.1
1978	161.2	226.9	192.9	239.1	239.5
1979	191.3	277.5	241.7	295.2	286.6
1980	232.2	323.6	299.1	331.4	343.3
1981	330.6	437.8	460.2	478.5	451.4
1982	419.6	544.9	496.5	581.8	535.4
1983	488.8	638.1	n.a.	n.a.	n.a.

SOURCE: Instituto Nacional de Estatística (INE), *Estatísticas Agrícolas* (Lisbon), various years.

n.a. = not available.

[a]Arithmetic average of fifteen reporting regions. Excludes Lisbon, Santarém, and Setubal. All wage data exclude social security and other personnel expenditures that might be made by employers.

[b]Southern region wage rates are arithmetic averages for Beja, Evora, Faro, and Portalegre.

[c]Northern region wage rates are arithmetic averages for Braga, Braganca, Porto, Viana do Castelo, and Vila Real.

[d]Central region wage rates are arithmetic averages for Aveiro, Castelo Branco, Coimbra, Guarda, Leiria, and Viseu. Leiria data are excluded after 1979 because of the development of large anomalies in reported values for wages.

The most significant change in nominal wage patterns has been an increase in the wage rates for women relative to those for men. Between 1965 and 1973, women's wages consistently averaged 60 percent of men's wages. In 1974, the ratio began to increase rapidly, and since 1977 women's wages have remained at about 75 percent of men's wages. The reasons for this increase are unclear. The change coincides with the implementation of minimum-wage legislation in 1974, which provided equal wages for both sexes. The legislation might have raised women's wages, particularly in the lower-paying southern regions. This effect could only have been temporary, however, because minimum wages are currently well below market wages in most areas. A more significant influence on relative wages could have resulted from the effect of emigration on rural labor supplies. Sexual division of agricultural labor used to be common in Portuguese agriculture, but with the growth of off-farm employment opportunities the role of women in agricultural work has expanded. As a consequence, women's wage rates would be expected to rise over time relative to men's wage rates.

In the South, the prominence of hired labor means that wage rates provide a good indicator of the market cost of labor. But in the North, the use of observed wage rates as the market price for hired labor might be incorrect because farm labor is provided predominantly by the family. Even where labor-intensive tasks are involved, the use of hired labor has been limited by the development of labor exchange relationships that minimize cash requirements. Nevertheless, market wages for hired labor are a useful indicator of the implicit private value of northern farm labor. Both family labor and hired labor compete for nonagricultural work, and this competition should cause an equilibration between implicit and explicit agricultural wages. Of course, implicit wage rates often include some nonmonetary compensation, such as the security value of a self-produced food supply. But nonmonetary compensation is part of the private cost of labor, and thus market wages still provide a useful indicator of the money-equivalent cost of labor.

The data for real wage rates (Table 4.2) provide an indication of the dramatic changes in the labor market caused by the 1974 Revolution. Real wages in the agricultural sector increased by about 6 percent per year during 1965–73, a period of nonintervention in the labor market. Manufacturing wages grew at about the same rate, although they remained higher in absolute terms. The 1974 Revolution brought marked change. Nearly one-third of the industrial workforce was affected by the establishment of a minimum wage of Esc 3,330 a month (OECD 1974). The result of this policy was an increase in real-wage levels of about 50 percent in just two years (1973–75). Such an increase could not be sustained, however. Real wages declined by about 19 percent over the 1976–79 period, al-

TABLE 4.2. *Indexes of Real-Wage Rates and Inflation, 1965–84*

Year	Nominal-Wage Index for Manufacturing (1975 = 100)	Consumer Price Index	Real-Wage Index (1975 = 100)	
			Agriculture, Adult Men	Manufacturing
1965	17.0	38.9	60.5	43.7
1966	18.3	41.1	66.7	44.5
1967	19.7	42.7	70.4	46.1
1968	21.0	44.7	79.8	47.0
1969	23.1	48.0	81.0	48.1
1970	27.0	50.2	86.8	53.8
1971	35.5	54.0	90.9	65.7
1972	39.2	58.7	93.7	66.8
1973	43.0	64.9	95.6	66.3
1974	66.2	83.0	97.5	79.8
1975	100.0	100.0	100.0	100.0
1976	122.5	118.2	97.4	103.6
1977	146.2	150.5	87.9	97.1
1978	165.6	183.7	81.3	90.1
1979	199.1	228.1	80.0	87.3
1980	250.1	266.0	80.0	94.0
1981	300.4	319.0	90.3	94.2
1982	362.0	390.4	91.8	92.7
1983	429.7	490.1	85.6	87.7
1984	510.5	633.7	n.a.	n.a.

SOURCES: Manufacturing wage data and consumer price index data were provided by the Bank of Portugal. Six regional indexes are prepared but show relatively little variation. The CPI used here excludes housing rents. These prices are subject to official price controls, but widespread evasion makes it difficult to determine true market prices for housing.

n.a. = not available.

though they remained well above pre-Revolution levels; then they stagnated during 1980–82. An economic recession in 1983–84 caused manufacturing wages to decline further, to their 1974 level. Agricultural wages evince a pattern similar to that of manufacturing wages, except that the impact of the 1974 Revolution was less extreme. Real agricultural wages increased by only 5 percent between 1973 and 1975, and post-Revolution declines were somewhat larger. But by the early 1980s, both manufacturing and agricultural real wages were about 20 percent below their 1975 levels.

The real-wage data are consistent with the presence of strong linkages between the agricultural and nonagricultural sectors. Between 1965 and 1973, wage rates grew by 58 percent in the agricultural sector and by 51 percent in the manufacturing sector; between 1975 and 1983, wage rates fell by 14 percent in agriculture and by 12 percent in manufacturing. The principal anomaly in intersectoral comparisons involves the discrete jump of 50 percent in the index of nominal manufacturing wages during the 1974–75 period. Agricultural wages reported in the table do not include social security payments by employers. These payments represent about 24 percent of wages but are not made in all agricultural regions.

Temporary divergences in relative wages between the agricultural and manufacturing sectors are expected for a labor market subjected to as many shocks as that of post-1974 Portugal. The increased instability of real wages was a consequence of explicit government policies as well as exogenous changes in economic conditions. Fiscal policy, for example, attempted frequently to limit nominal-wage increases after 1975. During the 1977–82 period, parliament rejected attempts to legislate wage controls, forcing fiscal authorities to use less direct methods. Among those methods were wage norms that limited the amount of increased wages that could be passed on in higher prices for controlled commodities. Since price controls applied to about half of the consumer market basket, this policy had a significant effect. Norms were set below inflation rates, and nominal wages grew less than the norms in all years except 1981. Much of the increased nonagricultural employment reflects the growth of the government. By 1982, 15 percent of the domestic labor force was employed by the government, and civil servants accounted for 25 percent of the total wage bill. This increment to urban labor demand undoubtedly has been important in maintaining the gains in manufacturing wages relative to agricultural wages in the 1973–75 period.

The price data do not reveal the decline in agriculture's role as a price-maker in the labor market. Aggregate time-series data for sectoral shares of labor show a structural transformation process that is typical of rapidly industrializing countries. Between 1960 and 1980, for example, the share of the domestic labor force engaged in agriculture declined from 41 to 27 percent. In nominal terms, agricultural employment declined from 1.3 to 1.1 million persons while domestic nonagricultural employment increased from 1.8 to 2.9 million. The declines in agricultural employment would have been substantially larger were it not for the return of 500,000 expatriate workers from the former colonies in the mid-1970s. A substantial part of this new workforce was absorbed, at least temporarily, into the agricultural sector. The agricultural labor force increased by about 300,000 between 1970 and 1975. By 1980, most of this net increase in the agricultural workforce was absorbed by the industrial and service sectors, and the size of the agricultural labor force had returned to its 1970 level of 1.1 million.

Emigration has been a second important factor in the growth of the nonagricultural labor market. Approximately one-third (2 million) of Portugal's total labor force is employed outside the country, a proportion that has remained relatively constant since 1970. By 1980, emigrant employment was nearly double the level of domestic agricultural employment. Emigrants have come predominantly from the rural areas, and the substantial differentials between domestic and foreign wages for unskilled labor provide a principal rationale for this pattern. Remittances

alone averaged Esc 88,000 per emigrant worker in 1981, or about 60 percent of the average annual wage for domestic agricultural labor.

Adjustments to increased off-farm labor demand have differed markedly by region. In the South, choices between agricultural and nonagricultural employment tend to be mutually exclusive. Multiple cropping and the low labor intensity of production practices allow year-round on-farm employment. The use of temporary hired labor now is limited largely to a few custom services, such as land preparation or cork harvesting. In contrast, northern agriculture has expanded substantially the role of part-time farming. In areas where nonfarm opportunities are scarce, emigration provides the principal alternative to agricultural employment. Domestic growth in nonfarm employment has been geographically dispersed, reflecting expansion in the construction, furniture, pottery, shoe-manufacturing, and textile industries. As a result, many farm families have been able to commit one or more family members to off-farm opportunities. Remaining family members assume farming responsibilities, thus permitting adoption of less labor-intensive technologies in agricultural production.

The social wage rate for agricultural labor takes on properties similar to those of a tradable good. The importance of emigration in rural areas means that labor demand and supply conditions exogenous to Portugal have a major impact on domestic agricultural wages. Few domestic policies affect agricultural wage rates. All employers are legally required to make social security and unemployment insurance payments, equivalent to 24 percent of money wage payments in 1983. These payments usually are not made in the informal and agricultural sectors, except in the Alentejo and in parts of the Ribatejo. These factors suggest that market wages are probably a reasonable approximation to the shadow wage rate in northern agriculture. In the Alentejo and the Ribatejo, however, market costs of labor are assumed to exceed social values by 24 percent.

For the agro-industrial sector, shadow wage rates are estimated at 70 percent of observed market wages. Direct distortions of wages are represented by social security payments and the requirement that industries provide two months of additional wages in the form of vacation and bonus payments. These pieces of legislation have been at least partly responsible for the maintenance of the increased gap between agricultural and nonagricultural wages (50 percent) that appeared during 1973–75. A reduction of market wages to 70 percent of their current price represents a substantial decline in wage rates that are already low by European standards. But the number of potential negative influences on wage rates—the presence of substantial unemployment (about 10 percent officially, with unofficial estimates double that level), recent declines in new emigration opportunities, and the potential difficulties of sustaining public

sector employment levels under fiscal budget deficits—suggest that significant adjustments in market wage rates to the estimated social levels are not implausible.

Perhaps the most significant legislation in the industrial labor market involves constraints on hiring practices. An industrial worker may be hired on a three-month contract for a period of three years, after which the employee receives a lifetime contract. This law limits unemployment variations during the business cycle, but it also creates a mechanism to sustain low labor productivity. To avoid lifetime employment obligations, employers have the incentive to turn over the labor force continually, thus inhibiting the accumulation of skills. Further, the law limits the incentive to adopt more efficient, capital-intensive technologies.

Capital

Capital costs are evaluated on the basis of opportunity cost rather than cost of borrowing. The individual borrower is assumed to have alternative uses for borrowed funds—financial or durable assets or alternative investments—and agricultural systems must compete within the individual's asset portfolio for access to financial resources. New agricultural investments are thus compared against marginal rates of return on alternative investments. Market failures—capital market segmentation, imperfect information, or lumpy investment requirements—and specific government credit subsidy programs can cause marginal rates of return to differ among individuals, economic sectors, or regions. The aggregate nature of this study precludes a complete specification of the distribution of rates of return. Instead, the focus is on discerning modal values for the economy and then assessing the reasons that agricultural sector returns differ from these values.

A measure of the average rate of return on capital investment can be derived from aggregate estimates of the value of the capital stock and the distribution of gross domestic product among factors. These derivations, described in Table 4.3 for the 1975–81 period, suggest an average pretax rate of return of between 10 and 15 percent. The behavior of this variable over time reflects the economic impacts of the 1974 Revolution. The wage increases legislated in 1974–75 created a significant redistribution of income from capital to labor. But the consequences of this change were substantial capital outflows, dramatic declines in investment in new productive capacity (to 20 percent of 1973 levels), and declines in capacity utilization (from 85 to less than 70 percent) (Aiyer 1981). These changes forced government officials to become more accommodating with output price policies, and high levels of output price inflation relative to wages allowed returns to capital to increase, although probably to a lower level

TABLE 4.3. *Distribution of Gross Domestic Product and Percent Rates of Return on Capital Investment (in Billions of Escudos), 1975–81*

Year	Gross Domestic Product	Labor	Land	Capital	Value of Capital Stock	Percent Rate of Return
1975	376.2	260.6	13	102.6	1,061	9.6
1976	467.7	321.3	15	131.4	1,302	10.1
1977	625.8	376.7	19	230.1	1,700	13.5
1978	787.3	450.3	24	313.0	2,230	14.0
1979	993.3	541.3	30	422.0	2,809	15.0
1980	1,235.0	680.0	35	520.0	3,478	15.0
1981	1,465.4	821.6	42	601.8	4,201	14.3

SOURCES: GDP and labor cost data for 1975–79 are taken from Hans O. Schmitt, "Economic Stabilization and Growth in Portugal," *Occesional Paper No. 2* (Washington, D.C.: International Monetary Fund, April 1981). These data are adjusted to account for subsequent revisions in GDP estimates prepared by the Bank of Portugal. Labor income for 1980 and 1981 is assumed to increase with the index of manufacturing wages. Returns to land for 1979 assume an average rental rate of 5 contos per hectare on a total area of 6 million hectares. Values for 1979 are deflated by the CPI to yield estimates for the 1975–78 period. Estimates of the value of capital stock are taken from Emanuel A. dos Santos, "O stock de capital na economia portuguesa (1953-81)," *Working Paper No. 6* (Lisbon: Gabinete de Estudos, Banco de Portugal, February 1984), table 58. Estimates represent the gross value of productive sector capital stock (excluding housing).

than that of the pre-Revolution period. By 1978, income distribution had stabilized, and average rates of return remained between 14 and 15 percent through 1981.

These figures suggest marginal rates of return of about 6 percent. If factor prices are equal to their marginal value products, the ratio of marginal to average product for the factor is equal to the share of the factor in total income. Over the 1978–81 period, capital's share of GDP was about 40 percent.

The incentives created by negative real interest rates on time deposits and the prominence of informal sources of credit suggest that agricultural rates of return are below those prevailing in the nonagricultural sectors. Table 4.4 provides data on inflation rates and interest rates. Before 1983, changes in official interest rates were infrequent and adjustments were generally less than changes in the inflation rate, creating an interest rate structure that offered consistently negative real rates to borrowers. Real savings rates were even more negative than lending rates; nominal savings rates were below lending rates and were further reduced by taxes on interest of 19 percent. Negative real rates encouraged the use of informal sources of credit and self-financed investments in agriculture and limited the (indirect) access of rural savers to nonagricultural investment opportunities.

These distortions are particularly prominent in the northern regions because of the availability of off-farm and emigrant employment opportunities to provide sources of funds for agricultural investment (Pearson, Monke, and Avillez 1985). Farm survey data for the North reveal that

TABLE 4.4. *Inflation Rates and Interest Rates, 1965–84*

Year	Inflation Rate	Time Deposit Rate[a]	Lending Rate[b]
1965	3.1	3.5	4.5
1966	4.9	3.5	4.5
1967	5.5	4.0	4.5
1968	5.9	4.0	4.5
1969	8.9	4.0	4.5
1970	6.4	5.0	5.25
1971	11.9	5.0	5.5
1972	10.6	5.25	5.5
1973	12.9	5.5	6.0
1974	25.2	6.0	7.75
1975	15.2	6.5	7.75
1976	18.2	9.5	8.75
1977	27.3	15.0	14.75
1978	22.0	19.0	18.25
1979	24.2	19.0	18.25
1980	16.6	19.0	18.25
1981	20.0	19.5	19.21
1982	22.4	21.5	23.0
1983	25.5	26.0–28.0	27.0–29.5
1984	29.3	28.0	28.5–29.5

SOURCES: Inflation data were provided by the Bank of Portugal. Time deposit and lending rates prior to 1976 were collected from Organization for Economic Cooperation and Development (OECD) *Economic Surveys: Portugal* (Paris), various years. Post-1976 data were provided by the Bank of Portugal.

[a]Rates are for six-month deposits.

[b]Rates are for short-term (ninety-day) loans. Short-term loans accounted for 90 percent or more of formal credit throughout the period. Medium-term and long-term interest rates generally have been 1 to 3 percent higher than short-term rates.

only 25 percent of total investment is financed by formal credit. Extrapolation of the survey data suggest a total annual investment in the North of about 30 million contos in 1982. Formally financed investment in the central and southern regions is of a smaller magnitude—24 million contos; 4 percent is assumed to represent the marginal rate of return in agriculture, but the presence of subsidized credit lines allows some agricultural investments to earn even less than this rate. If the investor obtains funds from outside the credit-line system (from unsubsidized formal or informal sources or through self-financing), investments in agriculture must compete with alternative uses for funds and thus must earn the market rate of return (estimated at 4 percent). The investor will use the credit line, however, if the targeted investment offers a return at least equal to the market rate of return less the rate of subsidy. Subsidies for agricultural credit range from 2 to 6 percentage points, and self-financing shares average 20 percent. Rates of return necessary to stimulate a credit-line investment are therefore 1.6 to 4.8 percentage points below the rate of return to alternative investments.

Two problems arise with the use of these apparent rates of subsidy in the evaluation of agricultural systems. First, leakages occur if subsidized

credit is not used for its intended purpose. In this event, the credit line does not serve to allocate funds to the targeted activity; instead, the activity must still compete with alternative uses for funds that earn market rates of return. Bank surveys of agricultural lending suggest that diversion of funds occurs to some extent (amounting to perhaps as much as 20 percent of credit volume). Second, transactions costs are associated with acquisition of the subsidy. These costs arise primarily from the lengthy application form and a time-consuming approval process, which together eliminate much, if not all, of the apparent subsidy, especially for small loans (Pearson, Monke, and Avillez 1985). Small farms (primarily in the North) are therefore assumed to operate without any subsidy to investment; their private opportunity cost of capital is 4 percent. Large farms (in the Alentejo and the Ribatejo) are able to make investments with subsidized credit and are assumed to require a 2 percent rate of return.

Estimation of the social rate of return is more speculative than is estimation of market rates, but post-1974 policies probably have depressed significantly the potential rate of return. Data for domestic credit availability are provided in Table 4.5. Credit grew rapidly through the end of 1973; real credit volumes increased at about 10 percent per year. But

TABLE 4.5. *Domestic Credit, 1965–84 (in Billions of Escudos)*

Year	Total Credit	Public Sector	Productive Sector			Real Credit (in 1975 Escudos)[a]
			Private Enterprises		Public Enterprises	
1965	64.4	1.7	62.7		—	165.6
1966	72.4	0.4	72.0		—	176.2
1967	78.1	1.9	76.2		—	182.9
1968	88.6	0.2	88.4		—	198.2
1969	107.2	−0.3	107.5		—	223.3
1970	127.5	−2.4	129.9		—	254.0
1971	154.7	−4.2	158.9		—	286.5
1972	198.0	2.6	195.4		—	337.3
1973	259.2	−0.2	259.4		—	399.4
1974	314.2	9.9		304.3[b]		378.6
1975	372.5	34.1		338.4		372.5
1976	518.3	75.5		418.3		438.5
1977	702.9	123.3	419.7		159.9	467.0
1978	877.9	173.9	491.2		212.8	477.9
1979	1,103.4	250.9	604.1		248.4	483.7
1980	1,246.1	171.0	792.4		282.7	468.5
1981	1,650.3	305.4	1,023.8		321.1	517.3
1982	2,150.1	462.2	1,304.0		383.9	550.7
1983	2,689.7	582.7	1,550.0		556.1	548.8
1984	3,323.8	774.3	1,825.3		724.2	524.5

SOURCE: Bank of Portugal.
— = not applicable.
[a]Total domestic credit deflated by the CPI.
[b]Available data for 1974–76 do not distinguish between private and public enterprises.

after 1974, patterns of credit growth reflect the influence of fiscal and monetary policy objectives. Rates of increase averaged nearly 4 percent per year during the 1975–84 period, but the availability of credit for the productive sector (private and public enterprises) increased by only 2 percent per year.

The public sector became an increasingly large borrower of domestic credit as the growth in government spending programs (primarily for civil servants' salaries, commodity and transportation subsidies, and social security) exceeded the growth in government revenue. The data of Table 4.5 indicate that the public sector (excluding public enterprises) accounted for almost none of domestic borrowing in the pre-1974 period but increased its share to 23 percent by 1984. External borrowing by public sector enterprises has also become a significant source of credit to the productive sector. Only loans with public sector guarantees can obtain Eurodollar financing, a condition that prevents private firms from using the Eurodollar market. Portugal's high reliability rating allows the government to borrow dollars at three-eights of a percent above the London Interbank Offered Rate (LIBOR). In 1981, for example, twenty-six Eurodollar loans were made to public sector companies for about Esc 120 billion ($US 2 billion), about one-half of domestic credit borrowing by public enterprises. Most of the loans are made on a short-term basis to finance the imports of raw materials and intermediate inputs.

Credit controls were instituted at the beginning of 1978 and maintained by the assignment of monthly lending rations to each bank. With only minor variations, this system has remained in force throughout the survey period. Within the total capital ration for the productive sector, the government attempts to direct lending toward particular industries. Control over investment patterns is influenced on the supply side by the creation of specific lines of credit for each industry and by linkages between credit rations for banks and lending to high-priority sectors. On the demand side, borrowing for particular sectors (housing, exports, tourism, agriculture, and activities with high domestic value-added) is encouraged by the provision of interest rate subsidies ranging from 2 to 6.5 percent. Preferential credit increased from 20 to 38 percent of total private sector credit between 1979 and 1982, raising the total subsidy bill paid by the Bank of Portugal from Esc 3.6 billion to Esc 12.3 billion. Although agriculture is considered a preferred sector and received the maximum interest subsidy, most subsidized credit is directed to export industries and housing. Agriculture's share of preferential credit declined from 10.2 to 5.9 percent between 1979 and 1982 while increasing in nominal terms from Esc 16.6 billion to Esc 35.3 billion.

Normally, the reduction in credit available to the productive sector would be expected to raise interest rates and the marginal rate of return.

But the magnitude of the credit subsidy program and the prominence of the public sector as a borrower explain at least in part why the government has refused to use interest rates as an allocative mechanism. In some cases, banks increase the real cost of capital for borrowers by requiring that interest be paid in advance. When nominal interest rates and inflation rates were high, these policies imposed substantial costs on borrowers. In 1984, for example, both inflation and nominal interest rates were about 29 percent. The apparent real cost of capital was zero. But for those borrowers who paid interest in advance (receiving Esc 71 now and paying back Esc 100 at the end of the year), the real interest rate was about 9 percent: ([(1/0.71)/1.29] − 1).

As a consequence of credit policy, the economy has undoubtedly experienced misallocations from potentially high-return to low-return investments, although the magnitude of this effect is unknown. Real rates of return must be quite high for firms that pay interest in advance but can be near zero for those that receive interest rate subsidies or avoid paying interest in advance; 8 percent is used as an indicative marginal rate of return. Agricultural investment is a minor share of total demand for credit, and the agricultural sector can be considered a price-taker in an undistorted capital market; 8 percent is thus used as the social cost of capital in agriculture as well.

Land

Table 4.6 provides estimates of market prices for different qualities of agricultural land. In general, prices vary directly with soil productivity and crop values—irrigated land in the Algarve for citrus and vegetable production commands the highest prices, and low-productivity dryland soils in the Alentejo are priced the lowest. About 2 percent of agricultural parcels are sold each year; the number of official transactions declined slightly between 1978–80 and 1981–83 (from 130,000 sales per year to 115,000). Relative to the number of parcels, turnover rates were somewhat larger in the Alentejo and the Algarve (4 percent of parcels sold per year) than in the central and northern regions (2 percent) (Monke, Sá, and Santana 1986).

In general, government policies have had little positive impact on activity in the land market. Formal credit institutions play only a limited role in the financing of land purchases, accounting for less than 5 percent of the total number of transactions. In part, this small volume reflects the availability of funds from alternative sources, particularly where emigrant remittances are prominent. But loan regulations also create some disincentives for the use of formal credit. All large loans require a Ministry of Agriculture evaluation, which considers whether the proposed sale meets

TABLE 4.6. *Market Prices for Land, 1983 (in Contos per Hectare)*

Region and Zone	Market Prices			
	Dryland Soils[a]		Irrigated Land	
	A and B	C and D	1+	2+
Northwest				
Entre Douro e Minho:				
Porto and coastal areas	300–400		1,500–2,000	
Braga	300–400		2,000	1,000
Trás os Montes:				
Vila Real	400	150–200	2,000	1,000
Bragança	300–400	150–200	500–1,000	
Beira Litoral				
Aveiro	700–800		1,000–1,500	
Viseu	300–500		1,000–1,500	
Coimbra	200–300		1,000–1,500	
Beira Interior				
Castelo Branco and Guarda	300–400	150–200	1,000–1,500	400–600
Cova da Beira	300	200	800–900	500–600
Ribatejo e Oeste				
Ribatejo	100–200	70–80	800–900	500–600
Oeste	200–300	100–200	1,000–15,000	500–1,000
Alentejo	125–150	50–75	500–800	200–300
Algarve				
Barlavento:				
Mountain	100–200		600–700	
Transition	400–700		800–1,000	
Sotavento:				
Transition	1,000	500	1,500	
Litoral	800–1,000	400–600	2,000	

SOURCE: Eric Monke, Jacqueline Oliveira Sá, and Jorge Santana, "Land Market Policies and Portuguese Agriculture," *Report to* PROCALFER (Oeiras, mimeographed, 1986).

[a]A and B soils are suited to continuous cultivation; C and D soils must be fallowed or used for pastures or woodlands.

legal constraints on minimum units of cultivation, verifies that the prospective buyer derives more than one-half of total income from farming, and ensures that the purchase is part of a consolidation effort by the buyer. Most regional ministry offices interpret this restriction as requiring the purchase of a parcel contiguous with a parcel already owned by the prospective buyer. As a result, applications require four or five months to process and entail significant transactions costs for the prospective borrower.

Cash-flow problems often constrain both the magnitude and the frequency of land purchases through the formal credit system. If the Instituto Financeiro de Apoio ao Desenvolvimento da Agricultura e Pescas (IFADAP) renders a negative opinion on the loan application, banks may still complete the transaction. Only the subsidy element of the loan is disallowed. Subsidies begin at 10.5 percentage points in the first year of the loan and decrease in subsequent years, to 4.5 percentage points in the

fifth year. Thereafter, no interest subsidies are provided, and the borrower pays the unsubsidized interest rate, which was 32.5 percent in 1984. However, in all cases, loan terms are limited to ten years. With or without subsidies, a substantial profit stream in excess of land rents is needed to pay for land through the formal credit system.

An alternative program for land credit, Programa de Financiamento a Arrendatárias Rurais (Credit PAR), was established for certain regions in late 1979 and enlarged to cover the entire country in November 1984. The program was developed specifically to aid tenants who had rented the parcel of interest for at least three years prior to the loan application. Loan periods are for twenty years; interest rates are 3 percent for the first seven years and 6 percent thereafter. Maximum loan amounts per applicant were 5,000 contos until mid-1984, when the lending ceiling was increased to 10,000 contos. Through 1984, only about 850 applications had been approved, covering about 3,600 hectares. Over half of that total (1,900 hectares) is located in the Beira Interior; the average size of the purchase in this region was 20 hectares. Outside of the Beira Interior, land purchases per farm were small, averaging between 1 and 4 hectares. The Ribatejo e Oeste (in particular, the *concelho* of Torres Vedras) is the second most important region for use of Credit PAR, with nearly 1,000 hectares.

The small impact of the Credit PAR program reflects the effect of current rental laws, which create significant disincentives for landowners to engage in formal rental contracts. As with the formal credit system, administrative problems also have hampered the program. Loan applications must be approved by the Regional Directorates of the Ministry of Agriculture, which confirms tenancy status and concordance of the planned sale with the consolidation laws. Loan applications then are sent to an Evaluation Commission in Lisbon for a final decision. Committee meetings are infrequent (for example, no meetings were held between November 1983 and July 1984), adding to the time delays in loan evaluation. The most common reason for rejection is the proposed purchase price. Once the loan application is rejected, the tenant may not reapply. This regulation was deemed necessary because the Lisbon staff is too small to handle reapplications. As a result, interest in the Credit PAR program has declined steadily since the program's inception. Between 1980 and 1984, applications declined from nearly 1,000 to about 100 per year.

Consolidation programs represent a third set of policies that attempt to influence sales in the land market. The programs were begun in 1962 under the administrative authority of the Junta de Colonização Interna (JCI). The Consolidation Division of the JCI was abolished in 1974 and reconstituted in 1980 as part of the Instituto de Gestão e Estruturação

Fundiaria (IGEF). Efforts of the JCI focused on three *concelhos*—Viana do Castelo, Braga, and the Faro-Beja border. Only 450 hectares were actually consolidated; efforts were hampered by the lack of cadastral surveys for the target areas and the limited amount of funds relative to the costs of consolidation. Although funds for purchasing land were expected to be recovered through the subsequent resale of land, the terms of the loans (2 percent annual rate of interest for thirty years) were such that the purchasing power of the revolving fund failed to keep pace with the rate of inflation in land prices.

Since 1978, consolidation efforts have focused on three irrigated regions—Campo do Mondego (in the Beira Litoral), Cova da Beira (in the Beira Interior), and Várzea de Benaciate (in the Algarve). By the end of 1983, about 750 hectares had been acquired. As with the earlier efforts, shortages of manpower (fewer than thirty technicians) and funds have made consolidation efforts difficult. Program costs are in excess of Esc 1,000,000 per hectare. Although some of the cost involves road construction and improvements, a substantial increase in funds would be necessary for there to be a significant impact on farm structure in the areas where fragmentation is present. Further, the net benefits of consolidation programs vary widely among regions. In some areas, such as irrigated rice regions, consolidation offers attractive economies of scale, and producers are interested in adopting such schemes. But for the field crops of the North, current technological options do not offer such attractive economies, and farmer interest has been less enthusiastic. Benefits of consolidation often are limited only to reduced travel costs for the farmer. Current proposals to expand consolidation efforts (perhaps with EC accession aids) are concentrating on irrigated areas, such as the Sorraia Valley.

Table 4.7 indicates rental rates used in the calculations of private profitability of agricultural systems. In general, market rental rates are between 2 and 4 percent of land prices, a relationship consistent with rates of return to nonland agricultural investments. Both cash and in-kind payments are common throughout Portugal, although the latter are limited largely to grain crops. Some form of written contract between tenant and landowner is common, and handshake agreements are common for transactions between nearby residents.

Government legislation has had little impact on land rental rates, although regulations are intended to affect both tenant-owner relationships and rental cost. The 1976–77 land reform laws gave IGEF the authority to establish maximum rental rates for land. Before 1984, rental rates were intended to reflect a just share of the value of average gross revenues. Currently, rates are calculated on the basis of cost and return figures for principal crops. Variable inputs (including all labor) are evaluated at market prices, and market rental rates are used to approximate the costs of

TABLE 4.7. *Rental Rates for Agricultural Land, 1983 (in Escudos per Hectare)*

Region/Soil Type	Crops	Rental Rate
Alentejo		
AB	Wheat, sunflowers	3,450
C	Wheat	2,000
CD	Pasture	1,000
Irrigated[1]°	Rice	40,000
Irrigated[2]°	Tomatoes	25,000
Ribatejo		
Irrigated[1]°	Rice	40,000
Irrigated[2]°	Wheat, corn, sunflowers, grapes, tomatoes, sugar beets	20,000
Azores	Pasture	10,000
AB	Corn silage and ryegrass (dairy),	
Northwest	Corn, potatoes	23,000
AB	Grapes, traditional	900
	Grapes, modern	93,000

SOURCES: Author's surveys.

capital equipment. Four-fifths of the remaining profit is allowed as the maximum rental rate. Relatively high yields are used in the calculation in order to establish a realistic maximum rental rate. Three categories of dryland crops and four categories of irrigated crops are recognized. In general, rental regulations are not strictly enforced. Although rents have increased substantially relative to previous schedules, they remain well below actual market rental rates in all regions.

Tenant rights to land have been strengthened by the establishment of contractual relationships that prevent land sales without tenant consent. Initial rental contracts are for six years, and tenants have an option for one three-year renewal of the initial agreement. Rental rates, fixed at three-year intervals, are based on an official schedule. After the nine-year period, tenants may appeal to the courts to prevent eviction. Proof that eviction would result in economic harm to the tenant is a sufficient ground for the courts to rule in favor of the tenant.

Fears of lifetime tenancy and controlled rental rates that are often less than 1 percent of the prices for land provide strong disincentives for landowners to use the legal rental system. Most producers bypass official regulations in favor of informal agreements. Census data suggest a slight decline in the proportion of farmers renting land between 1968 and 1979, from 36 to 32 percent. But this difference probably reflects intentionally erroneous responses by farmers under the later census. Regional patterns of rental activity remained consistent over the period. About 25 percent

of producers rent land in the Trás os Montes, the Beira Interior, the Ribatejo e Oeste, and the Algarve. Above-average numbers of farmers (about 35 to 40 percent) rent land in the Entre Douro e Minho, the Beira Litoral, and the Alentejo.

No attempt is made to estimate the social rental rates for land. As a fixed input, land is a residual claimant on profits. With complete certainty and only one fixed input, social land rent would be equal to the social profit of the most profitable crop that could be grown on a particular type of soil. But risk considerations dictate that farms will not specialize in a single crop, and thus land rents would never increase to the level implied by complete specialization. A second problem for estimation arises because land is not the only residual claimant on profits. Other fixed inputs, such as management (and, on occasion, water), will also claim some shares of profits. These shares are incalculable a priori. As a consequence, subsequent analyses of agricultural systems focus on the changes in profitability implied by a movement from private to Euro-social prices. These changes indicate the direction of change in land prices and rents, allowing insights into likely changes of farmer wealth. Because the evolution of profits over time depends on technical change and developments in labor and capital costs, this discussion is deferred to chapter 13.

Dynamic Factor Prices, 1986–96

Table 4.8 provides data on the growth of national income (gross domestic product, or GDP) between 1965 and 1984. Pre- and post-Revolution performance differ markedly; annual growth in per capita income averaged 7.3 percent in the period 1965–73 and 1.3 percent in the period 1974–84. Since 1980, real per capita income has been almost constant. Causes of the slowdown in growth cannot be determined quantitatively, but three factors appear particularly important. First, substantial temporary disruptions in production resulted from the marked redistribution of income toward industrial and service sector wage earners. Second, the return of 500,000 expatriates and 150,000 members of the military created more growth in population than did natural increases in the entire 1976–84 period. Finally, reduced growth rates reflect the effects of a worldwide recession on the demand for Portuguese products and emigrant labor. International transactions were about one-third as large as GDP, and sluggish external growth undoubtedly constrained Portuguese expansion of both exports and emigrant remittances, especially in the 1970s and early 1980s.

One critical determinant of future rates of income growth involves the impact of EC accession on industrial sector output. Tariffs on EC-Portuguese traded goods have been largely eliminated, but administrative bar-

TABLE 4.8. *Gross Domestic Product, 1965–84*

Year	Gross Domestic Product (GDP)		Real GDP per Capita (Thousands of 1975 Escudos)
	In Billions of Current Escudos	In Billions of 1975 Escudos	
1965	107.5	222.9	26.16
1966	117.0	232.2	27.33
1967	130.6	250.6	29.41
1968	142.1	269.1	31.51
1969	155.9	277.7	32.63
1970	177.3	303.7	35.94
1971	198.6	324.0	38.53
1972	231.2	349.8	41.54
1973	281.5	388.8	46.12
1974	338.4	393.5	45.23
1975	376.4	376.2	41.30
1976	467.7	402.1	43.85
1977	625.8	424.9	45.94
1978	787.3	439.3	47.75
1979	993.3	466.3	49.93
1980	1,235.0	485.5	51.54
1981	1,465.4	489.4	51.52
1982	1,848.0	505.1	52.83
1983	2,279.2	503.6	52.90
1984	2,804.2	495.0	51.51

SOURCES: Instituto Nacional de Estatística and Bank of Portugal.

riers to trade remain; they are implemented principally through an import permit system. The adoption of market competition and liberalized foreign investment rules could thus spur improvements in the allocation of investment. Industrial sector growth is likely to depend most importantly on increased production of exportable labor-intensive manufactures. The assembly of electronics equipment and other consumer durables (such as automobiles and home furnishings), textiles, leather goods, ceramics, and cork products should provide attractive opportunities for investment, primarily because of Portugal's low labor costs relative to those in other EC countries. Paper and pulp industries could expand as well, if such expansion is warranted by raw material costs and availability. Significant changes might occur also in Spanish-Portuguese trade, because numerous nontariff barriers apply currently and Portuguese labor costs are well below those in Spain. Linkages to export-oriented industries should encourage some growth in basic industries, such as construction and materials. Transportation investment could also be significant in the immediate postaccession period; road, port, and rail improvements are critical if the industrial sector is to exploit the potential advantage of low labor costs in the production of manufactures.

But all these changes are likely to occur slowly during the first decade

of EC membership. Safeguard clauses give Portugal the right to close off markets if external competition grows severe. Barriers to Spanish-Portuguese trade can be maintained for five or six years after accession. Domestic controls on foreign investment (implemented by the Institute for Foreign Investment) can be maintained for the first four years; thereafter, free-competition rules are supposed to apply. In practice, however, a number of EC countries (particularly France, Ireland, and Greece) have retained autonomy over foreign investment flows. Labor taxation policies also can be maintained with some degree of autonomy. Accession might require slight modifications in benefits programs, but these modifications are not expected to affect substantially the wage rate structure.

The conduct of macroeconomic policy is a second determinant of economic growth rates. Public sector budget deficits, interest rate policy, and the rate of credit expansion to the productive sector represent a nexus of issues that will influence rates of domestic investment. The public deficit has proved difficult to reduce during the past decade, remaining on the order of 10 percent of GDP. As long as deficits remain, the government will find it difficult to liberalize interest rates, and private sector credit controls will likely remain the key instrument for limiting aggregate demand and inflation.

During the first ten years of EC membership, therefore, Portugal's economic growth is likely to be moderate. Base case projections assume a 20 percent increase in per capita incomes over the decade, an average annual rate of 1.8 percent. If the distribution of income among factors were to remain constant at 1980 levels, aggregate returns over the decade to labor, capital, and land would each increase at a similar rate. Current relationships among factor returns appear sustainable over the medium run. Both real wage rates and formal credit supplies have increased since 1980, and capital flight and underutilized capacity did not reappear as major problems after the late 1970s. In terms of relative factor rewards, the economy did not demonstrate signs of severe disequilibrium during the early 1980s.

The hypothesized increases in wage rates appear reasonable from a rough assessment of likely supply and demand conditions in the labor market. EC accession would ease restrictions on emigration, and economic growth in other member countries is likely to intensify external demand for Portuguese labor. In addition, the growth in domestic demand for labor should be strong because low domestic wages, relative to those in other member countries, mean that investments are likely to be concentrated in relatively labor-intensive industries. The current high rates of unemployment will moderate somewhat the impact of these increased demands on wage rates.

Domestic credit and labor market policies are assumed to be un-

changed in the base case. Capital needs probably can be met at current interest rates by domestic credit expansion and increased foreign investment. Gross domestic investment increased at about 2.3 percent a year during the 1970–83 period, and a continuation of recent rates of increase in financial capital appears sufficient to support the assumed growth rate. A capital output ratio of 4.3 and population growth rates of 1 percent per year suggest net new investment requirements of about Esc 1,200 billion (in 1980 prices) over the ten-year period. This magnitude represents about 10 percent of annual credit provided to the productive sector.

Increases in net investment would normally be expected to reduce average rates of return, but two features of Portuguese investment patterns are likely to moderate this tendency. First, foreign capital inflows will introduce new products and new technologies, and the implied rates of return will necessarily be higher than prevailing rates of return on existing investments. Second, current rates of return reflect a distorted investment pattern. The preferential credit system and controlled interest rates have not disciplined the credit market to allocate funds to investments that offer the highest rate of return. If EC accession results in increased liberalization of the banking sector or increases in direct foreign investment, higher-return domestic investments are bound to emerge as candidates for credit. For these reasons, the social rate of return to capital investment is assumed to be constant (at 8 percent) for the decade under consideration.

Conclusion

Portuguese factor markets have been subjected to much policy intervention, particularly since the 1974 Revolution. Perhaps the most significant impact of these policies has been the redistribution of income from owners of capital to labor, particularly nonagricultural labor. One of the consequences of these policies for agriculture is the encouragement of capital-intensive relative to labor-intensive agricultural systems. These differences appear more distinct between regions than within regions, because most of the labor-intensive systems are located in the North and the relatively capital-intensive production is concentrated in parts of the central and southern regions.

In spite of these policy effects, Portuguese labor costs remain low in comparison to those in other European countries, and this differential provides some substantive basis for the view that EC accession will encourage economic growth. But such benefits are likely to accrue only slowly, because the ten-year accession period provides for gradual harmonization of Portuguese investment and trade policies with EC regulations. The agricultural sector is a price-taker in the factor markets. The slower

rates of change in factor prices mean that Portuguese farmers will have more time to introduce the changes in technology needed to accommodate rising labor costs (and possibly rising capital costs as well, if policy reduces existing subsidies in the credit system).

The important issues for agricultural factor market policies involve their influences on patterns of technological change. Land market policies are likely to be particularly critical in this regard. These policies have not affected rental prices in the land market to the same extent as labor and capital market policies have affected wage and interest rates. But land market policies have influenced the accessibility of particular segments of the farm population to land resources and, ultimately, to new technologies. Current policy has encouraged self-financing and informal credit among small farmers (primarily in the North) and thus has made change relatively easier for the part-time rather than for the full-time farmer. For large farmers (located primarily in the central and southern regions), agricultural change is limited to those gaining access to subsidized credit rather than to those facing the most profitable investment opportunities. In both circumstances, losses in efficiency are inevitable. The effects of these losses on particular regions and agricultural systems are considered in the remainder of the book.

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PART TWO

Comparative Advantage in Portuguese Agriculture

5. Extensive Farming in the Alentejo

by Roger Fox

The Alentejo is a vast, rolling plain that extends southward from the Tagus River. From east to west it reaches from the Spanish border to the Atlantic Ocean. On the south it is separated from the Algarve by a mountain range that runs across the southern portion of the country. Three rivers, the Guadiana, the Sado, and the Mira, divide the Alentejo and form small valleys with rich, alluvial soils. Existing dams and wells provide irrigation water for about 72,000 hectares; plans for new dams would permit the irrigation of an additional 100,000 hectares. The future of irrigation in agriculture is a critical issue in the Alentejo.

The Alentejo occupies an area of approximately 2.6 million hectares, comprising 29.6 percent of the total area of mainland Portugal. About 90 percent of the area is classified as arable land, but the very poor soils of 1.7 million hectares of class D and E lands are generally considered unsuitable for cultivation. Only 4 percent of the area (112,197 hectares) is in the class A category. Appropriate use of the poorer soils is a long-standing issue in the Alentejo.

Rainfall is concentrated in the winter months, with the greater part of the region having an average annual rainfall of between 500 and 600 millimeters. The lack of summer rains restricts production during the warm growing season to drought-resistant crops and irrigated areas. Winter drought can severely affect the production of cereals and pasture for livestock. Excessive rain can be harmful to cereal production.

The Alentejo is known as the bread basket of Portugal. About 75 percent of the country's wheat comes from this region. Area, production, and yield data for the major crops of the region are given in Table 5.1. Except for the irrigated crops—rice and tomatoes—yields are considered low by European standards. Considerable areal variation in yields occurs because of soil types and local climatic conditions. Cereal yields on the best soils and under good management can be three times the regional averages. Because of climatic variations, annual yields are highly variable. For example, the wheat yield in 1984 was 1,937 kilograms per hectare; the 1975–84 average was 1,178. The high production risks, especially on the poorer soils, are associated with crop systems that use low levels of capital and purchased inputs.

TABLE 5.1. *Area, Production, and Yield of the Principal Crops Grown in the Alentejo, Average for 1975–84*[a]

Crop	Area Planted (in Hectares)	Production (in Metric Tons)	Yield (in Kilograms per Hectare)
Wheat	255,700	301,200	1,178
Oats	127,600	73,900	579
Barley for grain	57,400	46,000	800
Safflower	26,361	13,284	504
Corn	24,100	11,700	485
Chickpeas	21,100	7,900	375
Rye	13,400	6,300	466
Broad beans	11,800	6,500	551
Rice	11,300	50,100	4,431
Beans	5,100	1,700	337
Sunflower	5,100	1,700	580
Tomatoes	5,011	222,526	44,405
Potatoes	4,200	28,800	6,790

SOURCE: Unpublished data from the Alentejo regional office of the Ministry of Agriculture.
[a]Except for tomatoes, sunflowers, and safflower, which are average for 1970–76.

Not included in Table 5.1 are the data for grapes and cork. The area in grapes has increased in recent years, but wine production in the Alentejo accounts for only 3 percent of national production (Rego 1985, 33). Cork is harvested from cork oak trees scattered throughout the Alentejo but located primarily in the western part of the region.

Livestock production is also important in the Alentejo. The agricultural census of 1979 counted slightly fewer than 1 million sheep. Other regional livestock numbers for the same year are

Pigs	374,099
Beef cattle	230,729
Goats	164,498
Dairy cows	37,470
Mules	12,262
Donkeys	6,816
Horses	2,868

Policy Issues

Three related policy issues occupy much of the current discussion about agriculture in the Alentejo. Since 1974, the land reform issue has dominated the agricultural policy arena. The status and future of the cooperative and collective farms continue to be debated. The settlement of claims over "reserve" areas by landlords also receives a great deal of attention. This study does not analyze land reform issues in the Alentejo, primarily because of the impracticability of obtaining representative data from the cooperative and collective farms.

The use of C and D soils is a long-standing issue of continued importance in the Alentejo. Since Salazar's wheat campaign of the late 1930s, large amounts of C and D soils have been used for cereal production. Some technicians argue that such soils are inappropriate for cereal production and should be converted to pasture for the production of sheep and cattle. Although this study does not address the technical issues of soil utilization, it does compare the economic benefits and costs of using C and D soils for wheat production versus pasture for sheep, feeder calves, and beef.

Because of the lack of rain during the summer growing season and periodic droughts during the other seasons, whether or not to expand irrigation is a major policy question in the Alentejo. Private investments for developing on-farm water supplies from wells and reservoirs and public investments for larger hydroelectric and irrigation projects are advocated by some policymakers. This study does not attempt a full analysis of the benefits and costs of new irrigation investments; instead, it analyzes the private and social profitability of two crops—rice and tomatoes—currently produced with water from existing irrigation systems.

Characteristics of the Alentejo Systems

To address these policy issues, five crop production and five livestock production systems were defined and analyzed using the method presented in chapter 2. In addition, two wheat-flour processing systems were analyzed separately to determine the competitiveness and efficiency of Portugal's flour-milling industry.

Crop Production Activities

The basic characteristics of the farm-level crop production activities are contained in Table 5.2. Although these activities were chosen to represent typical production conditions in the Alentejo, the indicated crop yields do not correspond exactly to the average regional yields in Table 5.1. Wheat yields for both good and poor soils are above the overall averages for 1975–84. These higher yields are justified on the basis that higher-than-average levels of inputs are used and better-than-average management is assumed.

The lower sunflower yield in Table 5.2 is based on the fact that the regional average yield of 580 kilograms per hectare includes some irrigated acreage. For dryland sunflower production, the 500 kilogram per hectare yield is a normal one. Yield variability in dryland sunflower production is extremely large because of differences in soil moisture both within and between seasons.

The rice yield chosen for the Sado Valley is higher than the regional

TABLE 5.2. *Characteristics of Crop Production Activities in the Alentejo, 1983*

Item	Wheat		Sunflowers in Dryland Soils	Rice in Sado Valley	Tomatoes for Processing
	Good Soils	Poor Soils			
Yields (in kilograms per hectare)	2,000	1,350	500	5,000	35,000
Seeds (in kilograms per hectare)	170	150	8	200	35,000[a]
Fertilizer (in kilograms per hectare of nutrient):					
Nitrogen	114	82.8	39	117.5	139
Phosphorus	90	72.0	0	60.0	105
Potassium	0	0	0	0	105
Labor:					
In hours per hectare[b]	13.3	15.0	12.0	73.2	977.8
In escudos per hectare	1,583	1,786	1,272	6,048	61,011
Fixed inputs (in escudos per hectare)	4,642	4,874	3,633	11,638	6,174
Total private cost:					
In escudos per hectare	31,830	29,670	14,683	77,281	102,693
In escudos per kilogram	15.91	21.98	29.37	15.46	2.93
Gross revenue:					
In escudos per hectare	54,840	37,255	17,500	142,200	182,000
In escudos per kilogram	27.42	27.60	35.00	28.44	5.20
Returns to land and management (in escudos per hectare)	23,010	7,585	2,817	64,919	79,307
Land rental rates (in escudos per hectare)	3,450	2,000	3,450	40,000	25,000
Returns to management (in escudos per hectare)	19,560	5,585	−633	24,919	54,307

SOURCE: PES team estimates.

[a]Number of transplants per hectare.

[b]Hours for cultural practices only; figures do not include imputed hours for repairs, maintenance, and so on.

average because of better growing conditions and higher levels of input use. The yield for tomatoes for processing (35 metric tons per hectare) is considerably below the reported regional average (44.4 metric tons per hectare); in recent years, tomato yields are believed to have declined. Nevertheless, tomato production is extremely profitable under the assumed conditions. Although both the rice and the tomatoes require irrigation, they are not considered substitutes in production. Rice is grown in

the heavier soils of the valley floors, where flooding is possible. Tomatoes are grown on the better upland fields and compete with irrigated melons.

All of the crop production activities in Table 5.2 show positive returns to land and management under 1983 conditions. Deducting estimated 1983 land rental rates from the returns to land and management yields estimates of returns to management (profit or loss). Four of the crop activities are privately profitable under 1983 conditions and exhibit good returns per hectare and as a percent of gross revenue. The two irrigated systems (rice and tomatoes for processing) have the highest returns per hectare.

Only sunflowers are unprofitable under the assumed conditions. Their unprofitability is probably overstated, however, since sunflowers are normally planted as a catch-crop before wheat in the rotation. It is unlikely that the rental rate of Esc 3,450 per hectare would be charged for both sunflowers and wheat. The more likely practice is one in which a rental rate is fixed for both sunflowers and wheat. If this rate were Esc 3,450 for the fifteen months required to produce both crops, the combined returns to management would be Esc 22,377 per hectare (23,010 + 2,817 − 3,450).

Livestock Production Activities

Table 5.3 shows the basic characteristics of the five livestock production activities. The sheep, cow-calf, and pasture-fed beef activities utilize pasture as the basic source of feedstuff. The pasture area for each of these activities includes subterranean clover, mixed pasture, native pasture, and oats for hay or straw. Pasture technologies and costs reflect production on C or D soils. For each type of pasture, a separate budget was prepared, representing the normal production practices, costs, and expected outputs. The aggregated costs of pasture production are represented by the roughage feed costs in the table.

The pasture-fed beef activity requires mixed feed in addition to the pasture produced on the farm. This feed is needed during the winter, when pasture is scarce and the second-year animals are being fattened for sale. Mixed-feed consumption is estimated at 2 kilograms per head for 150 days. Less feed is required for the cow-calf activity, since the animals are sold at a younger age (seven months versus twenty-four months). It is also possible to manage the cow-calf activity so that fewer animals are fed during the winter months.

The feedlot beef activity is based on the purchase of feeder calves from a source such as the cow-calf producers or dairies. The feeder calves are fed rations and straw for one year and are sold for slaughter at 475 kilograms. Each animal consumes 815 kilograms of rations during the fattening period.

TABLE 5.3. *Characteristics of Livestock Production Activities in the Alentejo, 1983*

Item	Sheep		Pasture-Fed Cow-Calf	Feedlot Beef	Pasture-Fed Beef
	Medium Management	High Management			
Herd composition	300 ewes 12 rams 65 replacement ewes	375 ewes 15 rams 82 replacement ewes	50 cows 1 bull 20 replacement calves and cows	50 head	50 cows 1 bull 20 replacement calves and cows
Output (sales per year):	255 lambs	356 lambs	40 calves		56 feeder calves
Main product	190 lambs	274 lambs	28 head	49.5 head	28 head
By-products	52 cull ewes and rams 26,000 kg of oats 668 kg of wool	67 cull ewes and rams 26,000 kg of oats 870 kg of wool	9.2 cull cows and bulls 26,000 kg of oats		9.2 cull cows and bulls
Live weight at sale—main products (in kilograms)	25	25	180 males 160 females	475	550 males 500 females
Feed requirements per herd per year:					
Roughage (in forage units)	99,210	125,660	141,900	57,250	217,850
Mixed fed (in kilograms per hectare):	0		0	40,750	8,400
Pasture area (in hectares):					
Clover	50	50	50	0	50
Mixed pasture	10	10	20	0	20
Native pasture	40	40	60	0	140
Oats for hay[a]	20	20	20	0	60
Feed costs per herd per year (in thousands of escudos):					
Roughage[b]	452	615	532	1,217	1,745
Mixed feed	0	0	0	570	118

Total private costs:					
In thousands of escudos per herd	1,357	1,571	1,342	3,773	2,553
In escudos per kilogram[c]	286	229	276	160	171
Gross revenue:					
In thousands of escudos per herd	1,571	2,033	1,719	4,232	3,197
In escudos per kilogram—main products[c]	180	180	161	180	180
In escudos per kilogram—by-products	151	117	193	0	34
In escudos per kilogram—all products[c]	331	297	354	180	214
Returns to land and management:					
In thousands of escudos per herd	214	462	377	459	644
In escudos per kilogram[c]	45	68	78	20	43
In escudos per hectare	1,784	3,852	2,512	0	2,384

SOURCE: PES team estimates.

[a]For sheep and cow-calf pasture, oat straw; 1,300 kilograms per hectare of grain sold.

[b]Except for feedlot beef, these are annual costs of pasture production to maintain herds. For the sheep and cow-calf activities, pasture costs are reduced by the value of oats sold for grain (429 contos).

[c]Private costs and returns per kilogram of main product, live weight.

The sheep activities produce lambs for slaughter and cull animals, wool, and oats as by-products. Although some Alentejo sheep growers sell milk, in these activities milk is assumed to be consumed by the lambs. It is possible to manage the sheep activity so that seasonal feed demands coincide with pasture availability thereby avoiding supplementary feeding. Some of the large sheep stations, however, use concentrated rations to help fatten their lambs.

Two levels of management—medium and high—are specified for the sheep activities. Although the pasture areas are the same, better pasture and herd management permits an increase in the carrying capacity from 300 to 375 ewes. Furthermore, the fertility level in the high-management activity is greater—0.95 versus 0.85. Greater pasture productivity is obtained by fencing, which facilitates better pasture utilization and eliminates the need for an assistant shepherd. The subterranean clover in the high-management activity receives applications of 3,000 kilograms per hectare of limestone during the first and second years of its five-year cycle. The 40 hectares of native pasture receive a biannual fertilization of 300 kilograms phosphorous of (P_2O_5) per hectare in the high-management activity. Although fencing, limestone application, and fertilization of native pastures are not common in the Alentejo, they represent the more intensive management practices currently being recommended by some technicians. Many other management alternatives that are not evaluated in this study are being tested by farmers and researchers (Casquinha, Carvalho, and Sanders 1982).

All five livestock production activities show positive returns to land and management under 1983 conditions (Table 5.3). Returns per hectare for the four pasture-based activities were highest for the high-management sheep activity and lowest for the medium-management sheep activity. The benefits of good management are clearly demonstrated with these results. However, as indicated in Table 5.2, the class C soils for wheat generated more returns per hectare in 1983 than did the high-management sheep activity. As will be shown later, with EC membership this situation will change rapidly under projected conditions.

Processing Activities

Representative budgets were developed to reflect the private and social costs and returns for the processing of wheat, tomatoes, lamb, and beef. The tomato-processing budget for the Ribatejo is discussed in chapter 6.

The processing of Alentejo wheat is done in large, highly mechanized flour mills, called *espoadas*, with capacities between 3 and 10 metric tons of wheat per hour. The large, mechanized mills stand in constrast to the traditional stone-grinder mills, located largely in the North, which are

used primarily for milling corn for animal feed and flour. Only the *espoadas* are analyzed in this chapter.

Flour milling in Portugal is regulated. Prices for wheat, wheat flour, and bread are fixed by the government, although mill competition has made superfluous the flour price restriction. The quality of *espoada* bread flour is limited to two grades, first and second. Both the importation and the domestic production of wheat are monopolized by EPAC, and millers are required to purchase fixed proportions of domestic and imported wheat. *Espoadas* are required to purchase 30 percent of their wheat from domestic sources and are allowed to choose from a restricted list of imported wheats--usually hard red winter and US no. 2 soft.

The representative flour mill chosen for this activity has a capacity of 3.5 metric tons of wheat per hour and operates three shifts per day. Mills with different capacities exist, but the differences in profits between medium-size and large *espoadas* is small (Monke, Pearson, and Carvalho 1986). A medium-size mill was selected for this study because medium-size mills are most representative of the industry. Characteristics of the flour-milling activity are presented in Table 5.4.

Wheat, the raw material, is by far the largest cost item in the flour-milling budget, representing 87 percent of total costs. Unskilled labor is the next largest item, accounting for 6.5 percent of total costs. The fixed inputs of buildings, machinery, and land are only Esc 585 per metric ton of flour, reflecting the spreading of total fixed capital costs over 20,500 metric tons of annual output. Revenue to the flour mill comes from the sale of wheat flour and wheat bran; flour represents 77 percent of total

TABLE 5.4. *Characteristics of the Flour-Milling Activity in the Alentejo, 1983*

Item	Medium-Size *Espoada*
Capacity (in metric tons of wheat per hour)	3.5
Shifts per day	3.0
Milling ratio	0.764
Private costs (in escudos per metric ton of flour):	
Fixed inputs for milling	585
Skilled labor and administration	191
Unskilled labor	1,712
Intermediate inputs, excluding wheat	1,043
Raw material—wheat[a]	22,908
Direct taxes	21
Gross revenue (in escudos):	
Flour—1 metric ton	22,000
Bran—0.282 metric ton	6,486
Processing profit (in escudos per metric ton of flour)	2,026

SOURCE: PES team estimates.

[a]1.309 metric tons of wheat to produce 1 metric ton of flour and 282 kilograms of bran.

TABLE 5.5. *Characteristics of* JNPP *Lamb and Beef Slaughtering Activities in the Alentejo, 1983*

Item	Lamb	Beef
Shifts per day	1.0	1.0
Dress-out ratio	0.50	0.544
Private costs (in escudos per kilogram of carcass weight):		
Fixed inputs	0.58	0.60
Labor	8.86	7.70
Intermediate inputs, excluding live animals	1.76	1.84
Live animals	363.04	333.68
Gross revenue (in escudos per kilogram of carcass weight)	375.04	345.68
Processing profit (in escudos per kilogram of carcass weight)	0.80	1.86

SOURCE: PES team estimates.

revenue. Returns to management from the flour-milling activity were estimated at Esc 2,026 per metric ton, or 7 percent of gross revenue.

The processing of Alentejo lamb and beef is assumed to be done in one of the public slaughterhouses operated by the JNPP. The JNPP is also authorized to license private slaughterhouses that conform to certain health and sanitary conditions. Only one private firm has so far been licensed to slaughter beef; otherwise, all beef and sheep are slaughtered at JNPP facilities.

The characteristics of the slaughtering activities developed for this study are presented in Table 5.5. The cost of live animals represents about 97 percent of the total costs of slaughtering. The JNPP does not usually take possession of the animals but rather provides its slaughtering services to others, such as butchers, who acquire the animals directly from the producers. If the costs of live animals are omitted, labor becomes the most important item in the slaughtering budget. Since JNPP slaughterhouses receive investment and working-capital funds interest-free from JNPP's operating budget, private capital costs are low.

Alentejo System Results, 1983

The production and processing activities just described are combined with transportation and processing activities to form complete systems. Wheat, sunflowers, and rice are transported to wholesale market centers, where social output prices are defined. Since wheat is also milled in Portugal, a separate system is designed to analyze the transport of wheat from EPAC storage to the *espoada* and the transport of wheat flour to Lisbon. Wheat flour is the tradable output of this system. Tomatoes are

transported to a processing plant, where they are transformed into tomato paste. Lambs from the sheep activities and beef from the feedlot and pasture-fed beef activities are transported to a JNPP facility for slaughter. Since the Alentejo cow-calf activity produces intermediate inputs, it is not reported separately as a system.

Crop Systems, 1983

The private and social cost and revenue structures of the crop systems are presented in Table 5.6. Under the 1983 conditions, all but one of the systems demonstrate positive returns to land and management. Wheat in poor soil is unprofitable in social terms.

TABLE 5.6. *Private and Social Costs, Revenues, and Returns and Net Policy Effects for the Crop Systems in the Alentejo, 1983 (in Thousands of Escudos per Hectare)*[a]

Item	Wheat		Sunflowers in Dryland Areas	Rice in Sado Valley	Tomato Paste
	Good Soils	Poor Soils			
Private					
Labor	7.0	6.8	4.9	25.6	179.1
Capital	7.8	7.5	5.2	25.0	111.4
Tradables	19.1	16.7	6.0	36.6	155.7
Total cost	33.9	31.0	16.1	87.2	446.2
Revenues:					
Main	46.0	31.0	17.5	112.2	442.9
Secondary	8.8	6.2	—	—	62.2
Returns to land and management	20.9	6.2	1.4	55.0	58.9
Social					
Labor	5.7	5.5	4.0	20.3	137.2
Capital	10.3	10.7	7.1	33.8	180.8
Tradables	23.6	20.1	6.5	40.4	147.1
Total cost	39.6	36.3	17.6	94.5	465.1
Revenues:					
Main	36.7	24.8	19.6	149.0	419.1
Secondary	8.8	6.2	—	—	62.2
Returns to land and management	5.9	−5.3	2.0	54.5	16.2
Policy Effects[a]					
Labor	−1.3	−1.3	−0.9	−5.3	−41.9
Capital	+2.5	+3.2	+1.9	+8.8	+69.4
Tradables	+4.5	+3.4	+0.5	+3.8	−8.6
Total cost	+5.7	+5.3	+1.5	+7.3	+18.9
Revenues:					
Main	+9.3	+6.2	−2.1	−6.8	+23.8
Secondary	0.0	0.0	—	—	0.0
Net effects of policy	+15.0	+11.5	−0.6	+0.5	+42.7

SOURCE: PES team estimates.

[a]Plus (+) equals a subsidy, and minus (−) equals a tax.

— = not applicable.

The major differences between private and social costs are due to labor taxes (which are private labor costs higher than social labor costs), the subsidized private real interest rate of 2 percent versus the real social cost of capital of 8 percent, and subsidies for fertilizer (which lower the private costs of tradable inputs). The labor taxes represent the effect of employee social security taxes. Although some agricultural employers do not pay these taxes, it is believed that most Alentejo farmers and processing industries comply with the law. The subsidized interest rate reflects the provision of certain lines of credit at low interest rates. The low private cost of fertilizer results from the government's fixed prices to farmers and the subsidization of the fertilizer manufacturing industry. Fertilizer subsidies, which reached over 100 percent in the early 1980s, were essentially eliminated in June 1983. The pre-June levels are maintained in the 1983 base case systems because farmers had already purchased fertilizer for the 1983 crops before prices were increased.

The wheat, sunflower, and rice systems are essentially farm-level systems with very low postfarm costs. The tomato paste system, on the other hand, includes a large amount of postfarm processing costs, as indicated in the following cost breakdown for 1983 (in escudos per kilogram of paste):

	Private		Social	
	Farm	Postfarm	Farm	Postfarm
Labor	11	19	8	15
Capital	2	17	3	28
Tradables	4	22	6	19
Total	17	58	17	62

The competitiveness of the tomato paste system depends heavily on the postfarm processing activity that uses a large amount of subsidized capital. Removing the subsidy would increase postfarm capital costs by 65 percent (17 to 28 escudos per kilogram of paste). In 1983, the capital subsidy in tomato processing was nearly offset by taxes on labor and tradable inputs.

Social output prices in 1983 were less than private prices for wheat and tomato paste. The high private price for wheat (25 percent above the equivalent world price in 1983) reflects the longstanding Portuguese policy of encouraging wheat production. Wheat prices to producers are fixed before the planting season and are implemented by EPAC, which acts as the sole buyer of all wheat. The higher private price for tomato paste is due to an export subsidy that benefits tomato processors and producers. Because of this protection on output and the net subsidization of wheat and tomato paste costs, these systems had much lower social than private returns in 1983 (Table 5.6).

Although the social prices of sunflowers and rice are above private prices (reflecting a small tax on producers), social and private returns for these two systems are about equal. Policy in 1983 favored the wheat and tomato paste systems but had negligible net effects on the production of sunflowers and rice.

Flour-Milling System, 1983

The 1983 cost and revenue structure for flour milling indicates that the system was profitable in both private and social terms (Table 5.7). Private and social returns to flour milling were 5 and 12 percent, respectively, of total revenues. The higher social profitability represents the net effects of policy—taxing the flour-milling industry by about Esc 2,920 per metric ton of flour.

A complex tax and subsidy system was responsible for the net taxation of the industry. The primary raw material, wheat, was subsidized to the degree that flour millers acquired wheat at about 5 percent below the world market price (CIF price plus unloading and local transportation costs). Other tradable inputs also were subsidized, primarily because this category includes storage and interest on working capital, which offset the taxes on fuel, electricity, and insurance. Large subsidies on capital resulted from the legal restrictions on interest rates described earlier.

Contrary to policy for the other systems, skilled labor in the flour-milling system was subsidized. The labor costs of unloading the wheat from ships, transporting it, and putting it in EPAC storage facilities are paid by EPAC, thereby representing a subsidy to the flour industry. Total

TABLE 5.7. *Private and Social Costs, Revenues, and Returns and Net Policy Effects for the Flour-Milling System in the Alentejo, 1983 (in Escudos per Metric Ton of Wheat Flour)*

Item	Private	Social	Effects of Policy[a]
Skilled labor	662	750	+88
Unskilled labor	1,898	1,549	−349
Capital	1,046	2,560	+1,514
Tradables, excluding wheat	662	1,042	+380
Raw Material—wheat[b]	22,908	24,046	+1,138
Total cost	27,176	29,947	+2,771
Revenues:			
Flour	22,000	27,690	−5,690
Bran	6,486	6,486	0
Net returns	1,310[c]	4,229	−2,919[d]

SOURCE: PES team estimates.

[a]Plus (+) equals a subsidy, and minus (−) equals a tax.

[b]1.309 metric tons of wheat to produce 1 metric ton of flour and 282 kilograms of bran.

[c]The private net returns are for the whole system and are lower than the net returns to the processing activity (Table 5.4) because of EPAC losses associated with EPAC's buying, selling, storage, and transportation of wheat.

[d]Net effects of policy.

unskilled labor costs also are partially subsidized, although the effect is more than offset by social security taxes.

The main tax in the system results from the fixed price for flour, which is about 20 percent below the world price. The low flour price is maintained in order to keep bread prices low. Modifications of the wheat, flour, and bread price regimes will occur as wheat trade is liberalized and EPAC loses its monopoly position. Social and private costs and returns will become more equal.

Livestock Systems, 1983

The 1983 cost and revenue structure for the four livestock systems is presented in Table 5.8. Under 1983 conditions, these systems were privately profitable but socially unprofitable. The combined effect of higher social costs and lower social output prices—both reflecting large subsidies to producers—accounts for the large differences in returns to land and management, especially for the sheep system. The lower social cost of labor is more than offset by the higher social cost of capital and tradables. Subsidies for fertilizer in the lamb and pasture-fed beef systems and for mixed feed in the feedlot system account for most of the differences between the social and private costs of tradables. Although the livestock systems were competitive under actual market conditions in 1983, they would not have survived without the direct support and protection of government policy.

The high private prices for lamb and beef—50 percent and 5 percent above equivalent world market prices, respectively—reflect the JNPP's controls over imports and storage. Consumer preferences for fresh lamb as opposed to imported frozen lamb could also explain part of the large difference between social and private prices for lamb.

Future Profitability and the Effects of Policy in the Alentejo

Chapter 2 described the methods of measuring comparative advantage used in this study. Chapters 3 and 4 described the assumptions and expected changes in output, tradable input, and factor prices through 1996, in both private and social terms. Output prices are adjusted to represent the two-stage transition process and expected EC prices. Private and social wage rates are assumed to increase, representing real income gains from economic growth. The real cost of capital is assumed to remain constant in both private and social values. The real social cost of tradable inputs remains constant, and the real private cost of tradable inputs is unchanged after a one-time adjustment in 1984 to reflect the removal of subsidies for fertilizer and mixed feed. Consequently, the patterns of change described in this section are conditioned by assump-

TABLE 5.8. *Private and Social Costs, Revenues, and Returns and Net Policy Effects for the Livestock Systems in the Alentejo, 1983 (in Escudos per Kilogram of Carcass Weight)*[a]

Item	Lamb		Feedlot Beef	Pasture-Fed Beef
	Medium Management	High Management		
Private				
Labor	185	131	41	76
Capital	113	104	43	72
Tradables	291	241	227	182
Total cost	589	476	311	330
Revenues:				
Main	378	378	349	349
Secondary	302	234	—	62
Returns to land and management	91	136	38	81
Social				
Labor	154	109	35	64
Capital	236	216	51	137
Tradables	334	285	262	217
Total cost	724	610	348	418
Revenues:				
Main	251	252	333	333
Secondary	213	165	—	51
Returns to land and management	−260	−193	−15	−34
Policy Effects[a]				
Labor	−31	−22	−6	−12
Capital	+123	+112	+8	+65
Tradables	+43	+44	+35	+35
Total cost	+135	+134	+37	+88
Revenues:				
Main	+127	+126	+16	+16
Secondary	+89	+69	—	+11
Net effects of policy	+351	+329	+53	+115

SOURCE: PES team estimates.
[a]Plus (+) equals a subsidy, and minus (−) equals a tax.
— = not applicable.

tions concerning the general macroeconomic environment, specific Portuguese policy changes, adjustment to EC policies, and expected EC price movements. All projected costs and revenues are expressed in real terms.

Crop Systems and Flour Milling

Declining wheat prices and increasing costs reduce the private and social returns for the wheat system (Table 5.9). The scenario follows. Wheat production on good soils remains profitable through 1993 and thereafter is slightly unprofitable. The private rate of return declines from 38 percent of total revenues in 1983 to −3 percent in 1996. Wheat pro-

TABLE 5.9. *Private and Social Costs, Revenues, and Returns and Net Policy Effects for the Crop and Flour-Milling Systems in the Alentejo, 1983–96 (in Escudos per Kilogram of Final Product)*

System and Year	Private			Social			Net Effects of Policy[a]
	Total Costs	Total Revenues	Returns to Land and Management	Total Costs	Total Revenues	Returns to Land and Management	
Wheat on Good Soils							
1983	16.92	27.42	10.50	19.76	22.79	3.03	+7.47
1986	19.22	26.98	7.76	19.41	16.62	−2.79	+10.55
1991	19.53	23.37	3.84	19.66	23.37	3.71	+0.13
1996	19.87	19.38	−0.49	19.94	19.38	−0.56	+0.07
Wheat on Poor Soils							
1983	22.99	27.60	4.61	26.90	22.97	−3.93	+8.54
1986	25.64	27.15	1.51	26.38	19.90	−6.48	+7.99
1991	26.09	23.55	−2.54	26.75	23.55	−3.20	+0.66
1996	26.58	19.55	−7.03	27.15	19.55	−7.60	+0.57
Sunflowers on Dryland Soils							
1983	32.04	35.00	2.96	35.17	39.23	4.06	−1.10
1986	33.43	38.74	5.31	34.21	31.78	2.43	+7.74
1991	34.29	38.69	4.40	34.92	38.69	3.77	+0.63
1996	35.24	37.57	2.33	35.70	37.57	1.87	+0.46
Rice in Sado Valley							
1983	17.44	28.44	11.00	18.89	29.80	10.91	+0.09
1986	17.87	33.19	15.32	18.42	24.94	6.52	+8.80
1991	18.32	30.48	12.16	18.78	30.48	11.70	+0.46
1996	18.82	33.45	14.63	19.17	33.45	14.28	+0.35
Tomato Paste							
1983	75.02	84.90	9.88	78.16	80.90	2.74	+7.14
1986	73.97	77.05	3.08	75.80	77.05	1.25	+1.83
1991	76.64	96.63	19.99	77.84	96.63	18.79	+1.20
1996	79.56	93.72	14.16	80.08	93.72	13.64	+0.52
Flour Milling							
1983	27.18	28.49	1.31	29.95	34.18	4.23	−2.92
1986	33.79	36.87	3.08	25.72	31.26	5.54	−2.46
1991	28.00	30.94	2.94	29.56	30.94	1.38	+1.56
1996	24.81	30.86	6.05	26.34	30.86	4.52	+1.53

SOURCE: PES team estimates.

[a]Plus (+) equals a subsidy, and minus (−) equals a tax.

duction on poor soils becomes unprofitable in private terms in 1987, and by 1996 losses are equal to 36 percent of total revenues. Since the assumed yield of the poor-soil wheat system is higher than the regional average (1,350 versus 1,178 kilograms per hectare), farmers who achieve the average regional yield or less face severe economic problems even in the unlikely event that their unit costs are lower. Under these conditions, declines in poor-soil wheat acreage and production can be expected.

With modest improvements in technology, wheat production on the better Alentejo soils will be able to compete with other European production. The yield for good-soil wheat would have to increase only 50 kilograms per hectare (from 2,000 to 2,050 kilograms) for the system to break even in 1996. By the end of the transition period, the net subsidization of wheat production in Portugal will be minimal and real wheat prices in Portugal will be less than the world wheat price in 1983.

The sunflower, rice, and tomato paste systems show a pattern opposite from that of the wheat systems (Table 5.9). Private and social output prices tend to increase or stabilize; and with the exception of sunflowers, net returns at the end of the transition period are higher than in 1983. Variations in product prices and profits occur as the different transition arrangements and harmonization adjustments come into play. All of these systems remain privately competitive, and by 1996 they earn reasonable rates of return with virtually no subsidies from the Portuguese government. In addition, these systems are socially profitable and therefore are able to compete in the European market. The two systems based on irrigated production—rice and tomato paste—have high private rates of return (44 and 15 percent of total revenues, respectively). The private cost ratios (PCRs) for the rice and tomato paste systems are 0.42 and 0.79, respectively, indicating that rice production yields a higher return to domestic resources, than does tomato paste (see chapter 2 for the definition of PCR).

Flour-milling profits increase considerably. Expected increases in flour prices combine with declining wheat prices to raise returns to 20 percent of total revenues by 1996. The flour industry shifts from a position of net taxation in 1983 under Portuguese policies to net subsidization under the combined Portuguese and EC policies. Positive social profit throughout the period suggests that flour milling has a comparative advantage within the EC. Because of the high cost of flour transportation, however, this advantage appears to be insufficient to enable flour to be exported.

Livestock Systems

Future profitability of the Alentejo livestock systems is presented in Table 5.10. The estimates indicate potential adjustment problems for the livestock sector.

TABLE 5.10. *Private and Social Costs, Revenues, and Returns and Net Policy Effects for the Livestock Systems in the Alentejo, 1983–96 (in Escudos per Kilogram of Final Product—Carcass Weight)*

System and Year	Private			Social			Net Effects of Policy[a]
	Total Costs	Total Revenues	Returns to Land and Management	Total Costs	Total Revenues	Returns to Land and Management	
Lamb—Medium Management							
1983	589	680	91	725	464	−261	+352
1986	622	651	29	708	562	−146	+175
1991	639	608	−31	721	519	−202	+171
1996	657	586	−71	736	497	−239	+168
Lamb—High Management							
1983	476	612	136	611	417	−194	+330
1986	534	583	49	597	515	−82	+131
1991	546	540	−6	607	471	−136	+130
1996	558	517	−41	617	449	−168	+127
Beef—Feedlot							
1983	311	349	38	348	333	−15	+53
1986	317	273	−44	343	204	−139	+95
1991	320	261	−59	340	261	−79	+20
1996	315	283	−32	335	283	−52	+20
Beef—Pasture-Fed							
1983	330	411	81	418	384	−34	+115
1986	359	335	−24	409	255	−154	+130
1991	365	324	−41	412	312	−100	+59
1996	370	346	−24	416	334	−82	+58

SOURCE: PES team estimates.
[a]Plus (+) equals a subsidy.

Under the assumptions of this study, the three pasture-based systems—medium- and high-management lamb and pasture-fed beef—become privately unprofitable when Portugal joins the EC. The expected decreases in output prices and the rise in costs cause dramatic changes in private profitability. The cost increases result primarily from the elimination of subsidies for fertilizer and mixed feed in the pasture-fed beef system and from the anticipated increases in wage rates for unskilled workers. The elimination of subsidies for fertilizer increases fertilizer prices by about 42 percent. Since the pasture-based systems use substantial amounts of fertilizer on improved pastures, the increasing fertilizer costs raise total costs by about 10 percent in the lamb and pasture-fed beef systems. The elimination of subsidies for mixed feed in the pasture-fed beef system raises total costs by an additional 3 percent.

Private losses in the high-management lamb and pasture-fed beef systems are not large; by 1996 returns to these systems are −8 and −7 percent, respectively. Changes in production techniques could make these systems privately profitable.

The negative social profitability of the three pasture-based systems indicates that Portuguese resources would not be employed efficiently in producing lamb and beef with current technology. Social returns in 1996 are highly negative for the two lamb systems and for pasture-fed beef (Table 5.10).

The net effects of policy for the lamb and pasture-fed beef systems are to subsidize producers and processors. Although subsidization declines under EC conditions, the level of subsidies remains high, especially for the lamb systems. The net subsidization of these systems is primarily the result of large interest rate and output price subsidies that more than offset the taxes on labor.

The feedlot beef system does no better than the other three livestock systems (Table 5.10). Lower prices and increased costs result in negative private returns by 1986. Net subsidization of the feedlot beef system declines because of the elimination of mixed feed subsidies and is not sufficient to make the system privately profitable. Improved feeding efficiency and better management could allow some feedlots to continue making profits. Social returns to the feedlot beef system are negative, indicating an inefficient use of Portuguese resources and the lack of comparative advantage under Euro-social conditions.

Policy Implications and Conclusions

The Alentejo crop and livestock systems will likely face a number of difficult adjustments. Some of the systems—wheat production on good soils, flour milling, sunflowers, rice, and tomato paste—generally are

profitable, both socially and privately, under expected EC conditions and do not present problems, even though profitability is slightly negative for good-soil wheat by 1996.

Major problems are associated with the results for the pasture-based livestock systems and wheat production on poor soils. These systems are expected to become unprofitable in both private and social terms. The available subsidy programs after accession are not sufficient to keep the systems privately profitable. Hence, they can be expected to decline in importance unless technical changes or new policies are introduced to make them competitive.

The changes in profitability of the lamb, pasture-fed beef, and poor-soil wheat systems are particularly perplexing. Portuguese farmers and agricultural technicians have recognized the problems of maintaining wheat production on poor Alentejo soils. It has been widely believed, and previous research has supported the idea, that the poorer Alentejo soils could be converted to pasture production for livestock grazing. The Ministry of Agriculture accepted this approach, and the World Bank financed a pasture improvement program in the Alentejo. The results of this study indicate the difficulty of future adjustments and suggest the need for new policy alternatives.

A comparison of the results for the medium- and high-management lamb systems illustrates the importance of management. Although the high-management system is unprofitable after 1991, it has a reasonable chance for survival, especially with modest improvements in technology. The medium-management system, however, will have to make major adjustments. Because of the lack of basic agronomic research on topics such as the response of native pasture to fertilization, the returns to research should be high. Reliable research results are a key element in better management, and good managers will quickly adopt new, profitable technologies. Training programs and information dissemination are important complements to the research efforts.

High risks remain a problem even for the more profitable dryland crop and livestock systems. Price risks are effectively controlled by Portuguese and EC policies, but yield risks continue to limit farmers' willingness to invest. The presence of high yield risks suggests the need to develop effective insurance schemes. The existing insurance program for cereals needs to be evaluated and extended to pasture improvement and cattle if cost-effective schemes can be devised.

Irrigation is an important means of reducing yield risks. Although the potential for efficient irrigation appears limited, farmers will continue to exert pressure for public support of irrigation development. New irrigation water, however, will probably be used on crops rather than on pasture for livestock.

The feedlot beef system also presents problems when considered within the broader context of Alentejo and Portuguese agriculture. The calves that are fed in the feedlot are assumed to be produced on a cow-calf ranch in the Alentejo. Although the cow-calf operation was privately profitable in 1983, it becomes unprofitable, as do the other pasture-based activities, when certain Portuguese subsidies are eliminated and EC policies are phased in. Therefore, feedlot managers might not be able to acquire calves at the assumed constant real 1983 price. They will have to pay more for Alentejo feeder calves or else shift to other sources of supply. Expanded feeding of dairy calves is one alternative. The realization of this alternative, however, depends on the future of dairying in northern Portugal and the ability of the Azores livestock sector to fatten more of its own dairy calves rather than continuing to send them to the Continent for fattening. Chapters 7 through 11 provide some insights into the future of dairying in the Azores and northern Portugal.

The continued private profitability of dryland sunflower production in the Alentejo suggests that output might expand. If Alentejo soils were uniformly good, sunflower production would no doubt increase; however, sunflowers are restricted to the best soils where yields are already highly variable. Expansion onto poorer soils would increase the risks of crop loss from inadequate moisture. Consequently, sunflower production is not expected to expand significantly, but it will continue to be rotated with wheat on the better soils.

The high private and social profitability of rice and tomato production has important implications for the future of irrigation in the Alentejo. This profitability suggests that there is a potential for expanding rice and tomato production if more irrigation water becomes available. However, several important questions need to be answered before new investments in irrigation projects can be recommended. First, the technical feasibility of producing tomatoes and rice in other locations needs to be considered. Second, complete investment analyses of alternative irrigation projects need to be conducted in order to determine the relative costs and benefits of these projects. It is possible that the benefits to tomato and rice producers would not be large enough to justify new irrigation investments. If so, the level of public support of the projects would have to be considered. Third, the influence on downstream users of water—for example, in the Algarve—would have to be considered before additional river waters were impounded for irrigation in the Alentejo. It is possible that some of the water would yield higher economic benefits in other locations and uses.

Alentejo farmers, realizing the risk-reducing and profit-enhancing potential of irrigation, will continue to lobby for public investment in irrigation projects. It is unlikely, however, that irrigation will provide the

solution to declining profits in the Alentejo. Even if improved technologies could increase yields and profits substantially, the potential irrigable area is very small relative to the vast area of cultivated land. The continued search for profitable dryland crop, livestock, and forest systems is necessary.

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6. Intensive Agriculture in the Vale do Tejo

by Francisco Avillez and Mark Langworthy

The Vale do Tejo in the Ribatejo region is an important Portuguese agricultural area, of about 465,000 hectares, that is transversed by the Tagus and Sorraia rivers. The region contains three agroclimatic zones, commonly known as Campo, Bairro, and Charneca.

The Campo is a floodplain corresponding to the lower Tagus and Sorraia valleys. It is composed of alluvial and saline soils and represents an agroforest area of about 70,000 hectares, most of which are irrigated. The Bairro is the zone north of the Tagus, about 160,000 hectares, with hills of medium slopes of nonhumic lithosols and brown and red limey soils. This zone, used mainly in dryland farming, is occupied largely by vineyards and olive trees.

The Charneca is a rolling plain south of the Tagus. It is made up of regosols, podzols, and litholite soils and contains more than 200,000 hectares, predominantly in forests.

The most intensive agricultural systems of the Vale do Tejo are located in the Campo. Until the early 1960s, the predominant agricultural focuses in the Campo were traditional (nonmechanized) vineyards, natural pastures, and rice. Important technical changes—mechanization of the vineyards, introduction of tomatoes for processing, and improved corn yields—greatly altered the production patterns in the late 1960s and early 1970s.

The Campo represents only about 16 percent of the Vale do Tejo agricultural land and forestland but includes virtually all of the region's irrigated area—about 40 percent of the land occupied by cultivated crops and pastures, and more than 20 percent of the vineyards. About 58,000 hectares of the Campo are planted in cultivated crops and temporary and permanent pastures. The main irrigated crops of the Vale do Tejo—rice, tomatoes, corn, and melons—are concentrated in this zone, as are the great majority of the irrigated forages and pastures. Permanent crops occupy the rest of the zone; vineyards are especially important, with nearly 11,500 hectares of high-yielding and relatively low-quality wine grapes. Because the Campo has the highest production potential of the Vale do Tejo region (and one of the highest in Portugal), it is important to

analyze the comparative advantage, under EC accession, of the major actual and potential agricultural systems of this zone.

Policy Issues

Two general policy issues concerning the Campo zone of the Vale do Tejo will be addressed in this chapter. The first is the impact of the introduction of the CAP market regimes on the profitability of irrigated production activities in the Campo. Since a number of crops are grown in this area, a related issue is the possible emergence of pressures to alter the present production patterns, caused by changes in the relative profitability of different crops. Some Portuguese policymakers have been concerned about the dominance of rice and tomatoes in the irrigated areas because of perceived negative ecological, economic, and social consequences of monoculture techniques used for these crops. However, the future share of rice and tomatoes in total production will depend on changes in their profitability relative to that of alternative crops. This chapter will compare rice and tomato systems with those of corn and irrigated sunflowers over the ten-year transition period.

Another aspect of crop choices in the Vale do Tejo is the introduction of sugar beets—not presently produced in Portugal—as a result of EC production incentives. Although this chapter will not attempt a full benefit-cost analysis of investment in sugar beet production, it will analyze the private and social profitability of a potential production system and compare it with the profitability of existing systems with which it would have to compete.

The second policy issue to be considered is the impact of flood control projects in the Vale do Tejo. Periodic floods and bad drainage cause excess water in the Campo soils during parts of the year. Flood control and drainage improvement are thus major policy issues in the Campo. The net benefits of these types of public and farm investments have been discussed for decades in Portugal. EC accession rekindles the discussion, because many farmers and regional policymakers think that the future profitability of agriculture depends on these kinds of investments. This chapter analyzes the impact of EC accession on the private and social profitability of the eixsting agricultural systems in order to obtain some preliminary answers to these key investment questions in light of expected changes.

Characteristics of the Selected Agricultural Systems

To address these policy issues, nine agricultural systems were defined and analyzed using the method presented in chapter 2. Five of the sys-

tems are based only on crop production and transport activities; the other four systems—tomatoes, rice, wine, and sugar—also incorporate post-farm processing activities. The basic characteristics of the farm-level crop production activities are shown in Table 6.1.

The wheat system comprises farm-level production and transport activities. Wheat production has increased recently in the Campo because of favorable farm prices, improvements in seed quality, and higher levels of fertilizer application. However, yields are variable because of inadequate methods of flood protection and drainage. An assumed average yield of 4 metric tons per hectare can be justified on the basis of good soils and modern production technology and management.

The production of wheat is practiced mainly by the medium-size and large farms as part of a rotation with tomatoes and corn. More recently, especially on larger and more technologically advanced farms, annual rotations of wheat and corn have been introduced, almost always associated with new irrigation systems. This expansion has been due to public and private investments in flood control and drainage. The wheat system represents a farm with an average area of 30 hectares, equipped with a relatively advanced production technology. It is assumed that transport from the farm to the EPAC silo is carried out with the farmer's own equipment.

The corn system is made up of a crop production activity and a transport activity. Corn production recently has grown enormously in the Campo, along with increasing average yields, which are now between 7 and 10 metric tons per hectare. These high levels reflect significant technological improvements in land preparation, precision planting, levels of fertilization, and irrigation.

Most corn farms in the Campo occupy irrigated areas larger than 10 hectares, and corn normally fits into a rotation including tomatoes, wheat, or melons. The type of irrigation system is important in determining yields in corn production. However, in spite of a recent increase in leveling and in the use of sprinklers and central pivots, most of the corn grown in this zone still is produced using furrow irrigation without prior leveling. The corn production activity is assumed to be part of a rotation in a farm with an area of 30 hectares under furrow irrigation without prior leveling and with an average yield of 7 metric tons per hectare. Transport costs are assumed to be identical to those of the wheat system.

The sunflower system is based on a production activity that is currently of minor importance in the Campo. Recent changes in real farm prices and technologies increased the profitability of this irrigated crop and hence its prospects for future expansion. The representative irrigated sunflower production activity is considered to take place on a farm whose size and other characteristics are similar to those of the other field crop

TABLE 6.1. *Characteristics of the Crop Production Activities in the Campo Zone of the Vale do Tejo, 1983*

Item	Wheat	Corn	Rice	Sunflowers	Melons	Tomatoes		Wine Grapes[a]	Sugar Beets
						Seareiro	Owned		
Yields (in tons per hectare)	4	7	5	1.75	17.5	45	40	14	50
Seeds (in kilograms per hectare)	180	25	200	5	7	37[b]	37[b]	—	0
Fertilizer (in kilograms per hectare):									
Nitrogen	110	270	90	60	80	310	310	150	160
Phosphorus	60	150	72	40	90	130	130	150	108
Potassium	45	150	24	—	120	130	130	100	60
Labor (in hours per hectare)	34	243	71.5	59	628	1,079	1,097	720	210
Tractor (in hours per hectare)	19.5	34	12	1.7	0	0	25.5	60	36

SOURCE: PES team estimates.
— = not applicable.
[a]Full production year.
[b]Thousand plants per hectare.

systems. With new seed varieties and appropriate levels of fertilization, an average yield of 1.75 metric tons per hectare is now accepted as being attainable in this zone. The transport activity considered is the same as in the two grain systems.

The melon system includes a crop production activity carried out by farmers who rent their land on an annual basis, locally known as *seareiros*, and a transport to market activity that is almost always undertaken by other economic agents. *Seareiros* are small-scale producers who arrange single-year land rental contracts with local landowners. They usually grow melons or tomatoes on small plots of land and practice labor-intensive techniques. One or two family members provide all of the labor input. This widespread Campo system is most commonly found on plots with an average size of 2 hectares. A 17.5 metric ton per hectare yield is average for this kind of farm.

The two tomato systems each include four different types of activities—production of tomatoes, transportation from farm to a processing plant, tomato paste processing, and transportation of paste to the Lisbon port. Because significant differences exist in the farming of tomatoes, two tomato system operations that differ at the production level—*seareiro* operations and farm-owner operations—are identified.

The *seareiro* tomato system is based on a production activity incorporating a one-year rental arrangement on fields that average 4 hectares. One or two family members provide the labor. This rental production activity is responsible for a large part of the regional supply of tomatoes for paste. The 45 metric ton per hectare yield used in the analysis is an average yield for this kind of operation.

The farm-owner tomato system is based on a production activity of farms with either long-term rental arrangement or owner-operators. The average farm size is 30 hectares, and the three-year rotation includes corn, melons, or wheat. Changes recently have occurred in the type of irrigation system used in this crop activity, but most of the tomatoes grown in the Campo are still produced using furrow irrigation without prior leveling. The yield specified for farm-owner production activity, 40 metric tons per hectare, is lower than that for the *seareiro* activity because of less intensive use of labor and management.

The postfarm activities are identical for the two tomato systems (Table 6.2). Transportation from farm to processor is done with the farmer's own equipment. Operating costs of the tomato paste processing activity are based on information from a representative firm from among the plants in operation in the Vale do Tejo. The transportation of tomato paste to the port is assumed to be carried out by the processing firm.

The rice system used in the analysis is based on production and processing activities considered representative of the Sorraia Valley, which

TABLE 6.2. *Characteristics of the Processing Activities of the Vale do Tejo Systems, 1983*

Item	Tomato Paste Manufacturing	Rice Hulling	White Wine Making	Sugar Beet Refining
Main final output per year[a]	5	7,800	3.4	63,000
Processing conversion ratio	0.17	0.69	0.75	0.13
Capacity utilization (percent)	50	80	90	100
Labor costs (in escudos per kilogram)	14.6	3.1	8.3	4.8
Capital costs (in escudos per kilogram)	15.1	5.2	9.5	15.0

SOURCES: Cooperativa de Produtores do Vale do Sorraia; Projeto de Industrialização da Beterraba Sacarina; PES team estimates.

[a]In metric tons for all but wine, which is in hectoliters.

accounts for over 70 percent of rice production activity in the Vale do Tejo. The representative production activity is based on an advanced technology on a farm where this crop occupies one-half of the irrigated area. A 5 metric ton per hectare yield of paddy (unmilled rice) is average for the soils of this region. The transportation of paddy is usually undertaken by the farmer using his own equipment.

The representative rice-hulling processing activity is based on technical and economic data from the Cooperativa de Produtores do Vale do Sorraia (COPSOR) (Table 6.2). Transportation from the processing center to the wholesale market is the responsibility of COPSOR.

Most wine produced in the Campo is white wine. The grape production activity is represented by large vineyards with modern growing technologies. Such vineyards currently produce most Campo grapes. The high assumed yields, 14 metric tons of grapes per hectare in a full production year, are typical in this zone. The grapes produce abundant quantities of low-quality wines. Wine making is assumed to take place in a modern cellar belonging to the farm. The basic characteristics of the wine system are presented in Table 6.2.

The sugar beet system does not exist but has been identified as one of the future crop alternatives for the region. Portuguese planners selected the Vale do Tejo as the best area of the country for the location of a new sugar beet factory. The data for production and processing activities of this potential system are drawn from a report produced by the Projecto de Industrialização da Beterraba Sacarina. It is assumed that the crop production will take place on a farm with characteristics identical to those of the wheat and corn systems. Production of refined sugar was chosen as the processing activity. The basic characteristics of the sugar beet farming and sugar beet refining activities are summarized in Tables 6.1 and 6.2, respectively.

Private and Social Profitability Results

The private and social cost and revenue structures of the Vale do Tejo agricultural systems are presented in Tables 6.3, 6.4, and 6.5. Under 1983 conditions, all of the farm-level activities demonstrate positive private returns to land and management. Based on Esc 20,000 in land rent for wheat, corn, rice, sunflowers, tomatoes (owners), and wine grapes and Esc 45,000 in land rent for melons and tomatoes (*seareiros*), all of the farm-level activities are privately profitable (Table 6.3). Melons present the highest private profitability at the farm level, but the possibility of expanding the area planted in melons is limited by the extent of the market and by the high level of intensive labor used in a very short period of time.

Farm-level production of tomatoes by *seareiros* is more profitable than that by owners because of higher yields obtained with the use of more labor at critical times. Lower private costs result because of lower wages attainable by the *seareiros* in alternative employment.

With 1983 prices, wine grapes exhibit the lowest private profitability at the farm level. However, most Campo grapes are processed into wine on the farms. When processing is included, the farm-level profitability increases almost fourfold.

The relative rates of return for rice and corn production explain the recent signficant shift in the cropped area away from rice and into corn. This shift has been the consequence of price movements and technological changes that have benefited corn production. However, rice is still an important crop in the Vale do Tejo region because a significant amount of the regional soils are heavy and the risk of floods is high; rice outperforms corn in heavier soils and can better withstand flooding. Some land has been shifted from wheat and sunflowers into corn, again reflecting the relative profitabilities.

The rice, tomato, and white wine systems include postfarm processing activities. Although wine is made on the farms, the other processing activities take place in industrial plants. Under 1983 conditions, the rice and white wine processing activities are privately profitable. The tomato paste processing activity has a negative private profitability because the factory is operated at only 50 percent of capacity. The breakeven level of capacity utilization is about 65 percent.

Table 6.5 reports the estimated social costs and profits of the Vale do Tejo systems. Sunflowers, melons, and rice have the lowest DRC values and thus are the most efficient systems. Wine, wheat, and corn have slightly higher values but still significantly less than 1. The tomato systems are near the breakeven point. Several elements must be considered in interpreting these comparative DRC results. Since melons have a

TABLE 6.3. *Farm-Level Private Costs, Revenues, and Returns per Hectare in the Vale do Tejo, 1983 (in Thousands of Escudos)*

Item	Wheat	Corn	Rice	Sunflowers	Melons	Tomatoes *Seariero*	Tomatoes Owned	Wine Grapes	White Wine
Total Input Costs	44.5	89.6	88.6	29.3	163.1	146.8	159.2	143.4	524.6
Tradables	22.4	37.2	36.2	11.5	57.7	43.3	45.5	64.0	273.6
Factors	22.1	52.4	52.4	17.8	105.4	103.5	113.7	79.4	251.0
Labor	7.9	30.8	31.9	9.5	81.8	92.2	100.6	71.1	157.6
Capital	14.2	21.6	20.5	8.3	23.6	11.3	13.1	8.3	93.4
Revenues	104.7	177.1	142.2	61.3	302.8	234.0	208.0	155.5	569.2
Main	92.0	161.0	142.2	61.3	302.8	234.0	208.0	155.5	563.8
Secondary	12.7	16.1	0.0	0.0	0.0	0.0	0.0	0.0	5.4
Returns to Land and Management	60.2	87.5	53.6	31.9	139.7	87.2	48.8	12.1	44.7

SOURCE: PES team estimates.

TABLE 6.4. *System-Level Private Costs, Revenues, and Returns in the Vale do Tejo, 1983 (in Escudos per Kilogram of Final Product)*[a]

Item	Wheat	Corn	Rice	Sunflowers	Melons	Tomato Paste		White Wine
						Searciro	Owned	
Total input costs	18.1	17.6	71.5	29.7	13.2	81.3	82.2	70.1
Tradables	6.0	5.7	40.9	6.8	3.7	27.4	28.4	35.2
Factors	12.1	11.9	30.6	22.9	9.5	53.9	53.8	34.9
Land	5.0	2.9	5.8	11.6	2.6	5.9	2.6	2.6
Labor	2.9	5.3	13.3	6.2	5.3	30.4	33.1	20.3
Capital	4.2	3.7	11.5	5.3	1.6	17.6	18.1	12.0
Revenues	26.2	25.3	81.7	35.0	17.3	84.9	84.9	73.2
Main	23.0	23.0	45.5	35.0	17.3	74.4	74.4	72.5
Secondary	3.2	2.3	36.2	—	—	10.5	10.5	0.7
Returns to Management	8.1	7.7	10.2	5.3	4.1	3.6	2.7	3.1

SOURCE: PES team estimates.
[a]Except for white wine, which is per liter.

TABLE 6.5. *System-Level Social Costs, Revenues, Returns and DRC in the Vale do Tejo, 1983 (in Escudos per Kilogram of Final Product)*[a]

Item	Wheat	Corn	Rice	Sunflowers	Melons	Tomato Paste		White Wine
						Searciro	Owned	
Total input costs	16.4	15.9	78.8	19.7	9.9	80.9	83.5	70.7
Tradables	7.9	6.2	54.8	7.2	3.6	25.8	27.0	35.7
Factors	8.5	9.7	24.0	12.5	6.3	55.1	56.6	35.0
Labor	2.3	4.2	10.8	5.0	4.3	26.4	26.8	16.2
Capital	6.2	5.5	13.2	7.5	2.0	28.7	29.8	18.8
Revenues	21.3	19.2	98.0	39.2	17.3	80.9	80.9	91.5
Main	18.4	17.1	55.0	39.2	17.3	70.4	70.4	90.8
Secondary	2.9	2.1	43.0	—	—	10.5	10.5	0.7
Returns to Land and Management	4.9	3.3	19.3	19.6	7.4	0	−2.6	20.8
Domestic resource cost ratio (DRC)	0.63	0.75	0.56	0.39	0.46	1.0	1.05	0.63

SOURCE: PES team estimates.
[a]Except for white wine, which is per liter.

limited market because of high transportation costs, their social profitability will decline with increasing production levels. The average returns of wheat and corn must be discounted to account for the yield risk of these crops that arises from their susceptibility to flooding. The per unit social costs in the tomato systems reflect the low rate of capacity utilization in processing.

As explained in chapter 2, the differences between private and social costs and revenues represent the effects of policies when market failures are unimportant. Different policies operate at the level of output prices, influence input prices, or create differences between the social and private factor costs of each agricultural system. With the exception of rice, white wine, and sunflowers, all systems were, on balance, subsidized by policies in 1983 (Table 6.6). The wheat and corn systems received net subsidies from policies affecting the output, input, and factor prices. Both tomato paste systems received a net subsidy, which was due mainly to the export subsidy for paste and the interest subsidy for capital. The rice, white wine, and sunflower systems paid net taxes, mainly because of implicit taxes on the value of the final outputs.

The net impact of Portuguese policies on the Vale do Tejo systems in 1983 was to alter substantially the relative ranking of their private rates of return per hectare as compared to their ranking on the basis of DRC. The sunflower, melon, rice, and wine systems had the highest rates of social profitability (lowest DRC values), followed by wheat, corn, and tomatoes. The net effect of policies was to increase the private rates of return of wheat, corn, and tomatoes so that they provided among the highest private returns per hectare.

Changes in Profitability under the CAP

The major expected impact of EC accession on Vale do Tejo agricultural systems is changes in output price levels. As explained in chapter 3, CAP support prices are likely to decrease in real terms during the period of Portugal's transition. This downward trend will be reflected largely in Portuguese prices, except for commodities that had significantly lower prices in Portugal than in the EC before accession. Projections of the costs and returns of Vale do Tejo systems incorporate these expected output price developments along with small changes in input costs caused by the elimination of Portuguese subsidies and the changes in factor costs described in chapter 4.

Table 6.7 shows the effects of projected changes in the prices of outputs, inputs, and primary factors on the profitability of the Campo agricultural activities. All of the farm-level activities remain privately profitable throughout the projection period. The projected 1996 farm-level

TABLE 6.6. *Policy Effects in the Vale do Tejo, 1983 (in Escudos per Kilogram of Final Product)*[a]

Item	Wheat	Corn	Rice	Sunflowers	Melons	Tomato Paste		White Wine
						Searcira	Owned	
Output prices	4.9	6.1	−16.3	−4.2	0.0	4.0	4.0	−18.2
Input prices	2.0	0.5	13.9	0.4	0.0	−1.6	−1.5	0.5
Factor costs	1.4	0.6	−0.8	1.0	−0.6	7.1	5.4	2.7
Total[b]	8.2	7.3	−3.2	−2.8	−0.6	9.5	8.0	−15.0
Total per hectare	32.8	51.1	−11.0	−4.9	−10.5	72.7	54.4	−116.6

SOURCE: PES team estimates.

[a]Plus (+) equals a subsidy, and minus (−) equals a tax.

[b]Columns might not sum to total because of rounding.

TABLE 6.7. *Farm-Level Private Profits, 1983–96 (in Thousands of Escudos per Hectare)*

Commodity	1983	1986	1991	1996
Wheat	60.2	55.9	40.8	24.0
Corn	87.5	73.9	65.1	28.4
Rice	53.6	77.7	61.2	73.0
Sunflowers	31.9	74.1	67.2	61.3
Melons	139.7	141.6	134.2	126.4
Tomatoes—*seareiro*	87.2	59.1	112.5	94.4
Tomatoes—owned	48.8	23.9	69.7	51.8
Wine	44.7	60.4	46.4	31.1
Sugar	—	—	49.1	35.4

SOURCE: PES team estimates.
— = not applicable.

profitability is higher than the 1983 level for four systems—rice, sunflowers, and the two tomato systems. Three other systems—wheat, corn, and wine—demonstrate substantial real decreases; however, the farm-level profitability of the melon system remains at approximately the 1983 level.

Sugar beets are not grown in Portugal. In the second phase of the transition period (1991–96) sugar beet production is projected to be a profitable farm-level activity, but the returns per hectare will not compare favorably with those of alternative crops.

These results are generally repeated in the system-level private profitability results that combine farming and postfarm activities. One difference is the slight negative profitability of the owned tomato system. This result is due to the high per unit processing costs (in both the *seareiros* and the owned systems) arising from the low level of capacity utilization.

The evolution of social profitability in the Campo agricultural systems after EC accession is shown in Table 6.8. By the beginning of the second phase of transition, at which time the social values of commodities covered by the CAP regimes will equal domestic market prices, all of the Campo systems will be socially profitable. They will remain efficient throughout the second phase.

In both private and social terms, existing agricultural activities will remain profitable throughout the entire transition period. Probable improvements in these technologies will generate even higher rates of return than those projected here. Within the overall picture of continued profitability of irrigated agriculture in the Campo, introduction of the CAP will cause significant changes in the relationships between the alternative crops in terms of profitability (Table 6.9).

Four general categories of changes can be identified. First, melon

TABLE 6.8. *System Social Profits, 1983–96 (in Escudos per Kilogram of Final Product)*

Commodity	1983	1986	1991	1996
Wheat	4.8	−1.0	5.6	1.4
Corn	3.2	−1.7	6.8	1.6
Rice	19.3	11.4	13.1	16.8
Sunflowers	19.6	12.7	19.2	17.5
Melons	7.4	7.7	7.3	6.9
Tomatoes—*seareiro*	0.1	−1.4	15.9	10.4
Tomatoes—owned	−2.7	−4.0	13.2	7.7
Wine	20.8	5.1	3.7	2.1
Sugar	—	—	13.7	8.0
	DRC Results			
Wheat	0.63	1.14	0.60	0.86
Corn	0.75	1.22	0.59	0.86
Rice	0.56	0.67	1.82	0.60
Sunflowers	0.39	0.48	0.39	0.42
Melons	0.46	0.44	0.47	0.50
Tomatoes—*seareiro*	1.00	1.03	0.78	0.85
Tomatoes—owned	1.05	1.08	0.81	0.88
Wine	0.63	0.87	0.91	0.94
Sugar	—	—	0.70	0.81

SOURCE: PES team estimates.
— = not applicable.

production will remain by far the most profitable activity in terms of returns to land and management. The high level of price risk and limited potential for local market expansion will continue to be factors that will limit expansion of this activity, since the CAP will not provide market support for the melon crop.

The second category consists of commodities that exhibit absolute increases in profits (relative to costs) and also increases relative to alter-

TABLE 6.9. *Ranking of Farm-Level Profits per Hectare, 1983 and 1996, and Percent Change in Absolute Profitability, 1983–96*

1983	1996	Percent Change in Absolute Profitability 1983–96	
1. Melons	1. Melons	Melons	−9
2. Corn	2. Tomatoes—*scareiro*	Tomatoes—*seareiro*	+8
3. Tomatoes—*seareiro*	3. Rice	Rice	+36
4. Wheat	4. Sunflowers	Sunflowers	+92
5. Rice	5. Tomatoes—owned	Tomatoes—owned	+6
6. Tomatoes—owned	6. Wine	Wine	−30
7. Wine	7. Corn	Corn	−68
8. Sunflowers	8. Wheat	Wheat	−60

SOURCE: PES team estimates.

native crops. This category includes rice, sunflowers, and tomatoes. The future changes in commodity policies will provide strong incentives to increase production of these crops in the Vale do Tejo at the expense of alternatives with declining returns.

The third category is represented by wine, which will suffer a decrease in the absolute rate of return to land and management but will provide higher average returns at the end of transition than do corn and wheat. The latter two crops are also more susceptible to flooding problems. The change in wine production will depend on the relative importance of absolute decreases versus increases in profitability in comparison to production alternatives. Farmers' decisions to produce wine will also be influenced by the availability of subsidies from the EC to uproot vineyards and shift to alternative crops.

The final category, comprising wheat and corn, will exhibit large declines in both absolute and relative terms. There will be strong pressure to move out of production of these cereals. One aspect of the change in profitability of Vale do Tejo agricultural systems is the relative increase of the more flood-resistant crops—rice and, to a lesser extent, wine grapes. To the extent that these crops replace corn and wheat, the net benefits of additional investments in flood control will decline.

The impact of Portuguese policies in generating these changes in relative profitability can be seen in Table 6.10. In 1983, wheat, corn, and tomatoes received substantial subsidies through Portuguese policies. The net subsidies represented 60 to 70 percent of profits for the two grains, and tomatoes received net subsidies greater than private system-level profits. The remaining systems—rice, sunflowers, melons, and wine—were taxed through Portuguese policies.

In 1986, all systems except melons received net subsidies. The level of subsidy per unit increased for all systems except melons and the two

TABLE 6.10. *Net System Effects of Portuguese Policies, 1983–96 (in Escudos per Kilogram of Final Product)*

Commodity	1983	1986	1991	1996
Wheat	8.2	13.0	2.6	2.6
Corn	7.3	10.3	0.5	0.4
Rice	−3.2	12.8	5.5	5.3
Sunflowers	−2.8	7.4	0.3	0.2
Melons	−0.6	−0.8	−0.9	−1.0
Tomatoes—*seareiro*	9.5	4.2	3.8	3.4
Tomatoes—owned	8.0	2.6	2.0	1.4
Wine	−15.0	2.7	2.3	1.9
Sugar	—	—	−1.5	−1.8

SOURCE: PES team estimates.
— = not applicable.

tomato systems. The most dramatic increases were for rice (500 percent), sunflowers (360 percent), and wine (118 percent). These increases provide substantial net subsidies for systems that had been taxed in 1983.

After 1990, the net Portuguese policy effects do not include commodity policies, since they are decided on and financed at the EC level in the second transition phase. The remaining policy effects are the result of policies influencing the cost of domestic factors; Portuguese policies are assumed to continue the subsidization of capital and the taxation of labor. Only in the melon and sugar systems will the taxes on labor per unit of output be greater than the capital subsidies. In all instances, the impact of Portuguese policies will fall drastically after 1990. Thereafter, the CAP will provide the major policy impacts on the systems, and the changes in relative profitability will be influenced heavily by EC policy decisions.

Summary and Conclusions

Irrigating agricultural land in the Campo zone of the Vale do Tejo is very profitable, both in private and in social terms. The policies in operation before accession provided net subsidies for cereals and imposed net taxes on wine and rice, commodities more suited to the poor drainage conditions of the Campo. As a result, the production of cereals increased dramatically in the years before EC accession. These crops require more controlled irrigation systems, and their expansion coincided with investments in irrigation and flood control projects.

The Vale do Tejo systems will continue to be profitable in the future even with the prospect of falling real price levels. Future productivity increases would improve the results reported in this chapter, which are based on constant technology.

Changes in relative rates of return for alternative activities in the Campo region will create incentives to alter the present allocation of land among crops. In particular, the rate of protection afforded to corn and wheat will fall substantially, while support for rice, sunflowers, and tomatoes will increase. Wine could also become more attractive relative to the grains.

Tomatoes and melons will have the highest potential returns. However, CAP market support for these commodities is not so direct as for other products; therefore, finding markets for tomato paste and perishable melons is a prerequisite for expansion of these activities. Previously expressed policy concerns about possible costs associated with widespread monoculture will continue as the private incentives to this type of activity increase.

Rice and sunflowers are alternative crops with high rates of return and more direct policy support. These crops are likely to become more wide-

spread in the Campo. Since both are presently grown in the Campo, there should not be major start-up costs—for adjusting technologies for local conditions or setting up a marketing network for inputs and outputs—associated with such expansion.

These changes have implications for the valuation of future flood control and irrigation projects in the Vale do Tejo. Given the relative prices of outputs under the CAP, the incremental benefits of such projects will be less. Future EC commodity prices will likely favor more flood-tolerant crops in comparison with previous Portuguese policies. Flood control could well continue to have positive returns, even if the area in rice and wine increases dramatically. But the issue facing policymakers is whether public funds should be used to improve rates of return on crops that are already quite profitable, especially when price signals would otherwise direct production patterns toward more flood-resistant crops.

7. Dairying in the Azores

by Mark Langworthy

The Azores are a group of islands located about one-third of the distance between Portugal and 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 0.25 million. Their main agricultural industry is livestock farming, with an emphasis on dairy products for export to the mainland of Portugal. The Azorean dairy output is about 23 percent of total Portuguese dairy production. The Azorean dairy industry is quite different from the dairy industry on the mainland. High milk output results from the use of naturally 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 thus minimizes the use of purchased feed. Most of the milk is processed into cheese or powder and shipped to the mainland. Skim milk powder is the major item in this trade; it serves as the raw material for mainland factories that produce cheese and special products.

Milk Production in the Azores

The economy of the Azores is heavily influenced by the production and 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—skim milk powder and cheese—represent close to 70 percent of the total value of Azorean exports. In 1981, the value of processed dairy products was estimated at 5 million contos (approximately $US 150 million). 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 eighteenth and nineteenth centuries, citrus orchards covered large parts of the islands and oranges were exported to England as a remedy for scurvy. When disease destroyed the viability of citrus production, Azorean farmers turned to mixed farming with an emphasis on high-value crops such as tobacco and pineapples. Milk production became significant

during the first three decades of the current century. After World War II, dairy-processing firms from mainland Portugal started operations in the Azores and provided incentives to farmers to build up herds. As a result, milk production increased from 45.5 million liters in 1945 to 220 million liters in 1981, an average annual increase of 4.6 percent. This production was intended initially to supply markets in the Portuguese colonies in Africa, including the military. After the colonies gained their independence, in 1974, these markets virtually disappeared. More recently, Azorean dairy exports have gone almost entirely to mainland Portugal.

In 1982, about 200 million liters of raw milk, 25 percent of the amount of milk produced on the mainland, were collected by local processing firms on the seven major islands. The number of cows in the Azores is only one-sixth of the mainland number, but nearly all the animals come from high-quality breeds. There is an accentuated seasonal variation in production—summer volumes of milk increase to twice those of winter—and this variation coincides almost exactly with oscillations in the mainland's milk supply. The islands of São Miguel and Terceira, with more than half the total number of producers and 72 percent of the dairy herds, dominate dairy production in the Azores (Table 7.1).

Most processing activities are also concentrated on these two major islands (Table 7.2). The large dairy firms produce mainly skim milk powder and cheese destined for the mainland market. During the low production season, mainland dairy processors rely heavily on the powdered milk from the Azores, which they reconstitute and sell as liquid milk or convert to cheese. Little raw milk moves between islands, and on the islands of lesser production, smaller specialized firms transform milk into cheese and butter. The São Jorge cheese (cheddar-type) has gained some recognition as a specialized product and has a small market in the United States.

TABLE 7.1. *Characteristics of Raw Milk Production in the Azores, 1980*[a]

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

SOURCE: Direcção Regional dos Serviços Veterinários.
[a]Does not include the islands of Corvo and Sta. Maria because of their insignificant number of producers.

TABLE 7.2. *Major Processed Dairy Products in the Azores, 1983*[a]

Island	Milk Received at Dairy	Raw Milk	Pasteurized Milk	UHT Milk[b]	Butter	Cheese	Skim Milk Powder
São Miguel	135,479	1,023	7,388	3,414	1,868	4,131	8,236
Terceira	44,185	0	3,654	7,641	982	345	3,343
São Jorge	13,407	154	0	0	0	1,170	0
Faial	8,494	831	0	0	88	661	0
Pico	3,575	174	0	0	10	309	0
Flores	2,052	35	0	0	7	176	0
Graciosa	628	41	0	0	0	55	0
Total	207,820	2,258	10,992	11,055	2,955	6,847	11,579

SOURCE: Direcção Regional dos Serviços Veterinários.
[a]Liquids in thousands of liters; solids in metric tons.
[b]Milk treated at ultra-high temperatures (UHT) so it will keep longer.
0 = no production.

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 area. The climate is characterized by high levels of uniformly distributed rainfall, high relative humidity, and moderate temperatures. On most islands, the elevation varies from sea level to about 1,000 meters and the quality of pasture grasses depends on the season. This pattern encourages a transhumance in which cattle graze on the mountainsides during the summer and then move into the lower altitudes (under 300 meters) 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.

The closely managed dairy cows spend all their 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 evergreen trees, which also have value as timber. Some dairymen control feeding by marking off pasture areas with temporary electric fencing. Others tether their animals in equal spacing across the pasture area; 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 times, the cows receive a small portion of mixed feeds, about 1 to 2 kilos.

Virtually all dairy cattle in the Azores derive from Holstein and Frisian breeds, and productivity per cow is high relative to that on the mainland. An important market for calves also operates in the islands. Most calves are shipped live to fattening yards on the mainland; in 1982, more than 48,000 live animals as well as 4,000 tons of beef carcass were sent to the mainland market. Some officials argue that poorer pastures or specialized islands (for example, Pico) could be used to fatten calves.

From the perspective of individual farmers, dairying has opened up new economic opportunities. The availability of subsidized agricultural credit has made dairying a feasible economic activity for a large segment of the population, including part-time farmers. Usufruct rights to land can be obtained with the purchase of a cow (about 5,576 square meters per cow), an active custom-work market facilitates pasture installation and maintenance, and the pasture-based system has few major manpower bottlenecks. All these factors lead to low start-up costs, making dairying accessible to many who are not professional farmers. The same incentives also encourage larger farmers to improve their herds and expand their farms, and these operations compare favorably with any in the United States and western Europe in technological sophistication.

Dairy Policies in the Azores

The insular position of the Azores, a region separated from the mainland by nearly a thousand miles of ocean, dominates the Azorean economy and policies. The local resource base is far too small to produce a wide variety of goods. Therefore, trade is required to supplement the limited number of locally produced goods with others that consumers desire. Trade is predominantly with mainland Portugal and less importantly with other western European countries, other Portuguese-speaking areas, and North America. Although the islands can lay claim to a natural production advantage, specialization in dairying can engender vulnerability to world market conditions. The international market for dairy products has been depressed for a number of years, reflecting the desire by industrial countries and the EC to remove surplus dairy production from domestic markets.

Before the independence of the Portuguese colonies in Africa, these colonies offered a stable and protected market for Azorean dairy products. Since the colonies gained their independence, exports have been directed toward mainland Portugal. The dairy sector is given preferential access to the protected Portuguese mainland market; it is within the Portuguese market as defined by policy. Imports from other countries are allowed into Portugal (under trade controls exercised by the JNPP) only if both mainland production and Azorean production fall short of requirements. This preferred access does not remove entirely the problem of instability, but it does change its nature. Azorean production becomes residual in the sense of complementing mainland production. Accordingly, policies and production trends on the mainland dictate the state of the market for Azorean dairy products. The demand for Azorean dairy products thus fluctuates with the state of the mainland market rather than with world prices.

The producer of raw milk receives a fixed price 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 in the Azores, and farmers sell their milk to one of several private firms or cooperatives. The farmers deliver the milk to collection points operated by the dairies. No fixed collection margin is paid. The dairies process the milk into powder or cheese for transportation to external markets; the processing margins are agreed on by the firms and the Azorean authorities. The government provides a consumer subsidy for 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. The JNPP controls the production of recombined milk on the mainland and supplies the raw materials. Preference is given to supplies from the Azores.

An analysis of dairy sector policies offers insights into the basic economic strengths and weaknesses of the Azorean dairy industry. As the initial step, representative dairy production activities were selected for analysis. With due attention to the great intraregional variability, a typical farm was identified as a numerically predominant type of farm—neither the most advanced nor the most rustic. For processing activities, the larger dairies (rather than the small, specialized ones) were considered representative. The final destination of output was assumed to be Lisbon.

The analysis covers two production/processing systems: edam cheese and skim milk powder. Both systems receive raw milk from the same representative farm; 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. Estimated shipping costs to Lisbon provided by the government maritime monopoly were used. The activities of the respective systems were defined at private (market) costs, and 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. The social costs of these systems were estimated using world prices for outputs and tradable inputs. The shadow pricing techniques

described in chapter 4 were used to estimate the social costs of labor and capital.

Three general questions were addressed: Were the basic dairy systems of the Azores profitable in 1983? Do these systems efficiently allocate scarce economic resources? What role does government policy play in either subsidization or taxation of dairy production in the Azores? Finally, an examination was made of changes in profitability resulting from accession to the EC and adoption of the CAP, thus giving Azorean policymakers a projection of the possible effects of Portugal's accession to the EC.

Selected Dairy Systems in the Azores

Dairy systems are made up of farm production, transport to the dairies, processing, and transport to the wholesale market in Lisbon. 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 follow descriptions of farming and postfarm activities.

Farming Activities

Azorean dairy farmers enjoy some of the most favorable natural conditions for milk production found anywhere in the world. Their islands possess 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 conservation. Farms also vary in size. However, even on the larger ones, herds tend to be split into groups of about forty cows, apparently the optimum number that two laborers can manage in an open pasture.

The representative dairy farm selected for analysis has twenty cows on 80 *alqueires* of land (in São Miguel, 11.15 hectares). More than 80 percent of the farms in the Azores have an average herd size of under twenty 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 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, hay balers, plows, fertilizer spreaders, and mowers, is so limited throughout the year that farmers find the prevalence of custom operators a significant convenience. Custom work largely restricts farm labor needs to herd management and milk transport.

The pasture-based dairy farm uses land located at varying altitudes.

This type of transhumant management assumes that half the farm (above 300 meters) is used essentially for the summer pastures and half (below 300 meters) 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 and a legume, normally clover. Under conditions of poor management, the pastures easily can suffer from invasion of native, less-nutritious grasses. The analysis assumes an average ten-year life and annual maintenance for permanent pastures, although many pastures produce adequately for two or three decades.

With the exception of mixed rations, feed is never transported to the animals. The cows spend their lives in the pasture areas, moving through the 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 water-tank wagons with automatic valves to where the herd is grazing. Most milking is done by hand in the pasture. One interesting innovation for larger herds has been the mobile milking machine operated on tractor power. 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 in the islands. Milk goes in 50-liter cans to the collection posts of the major island dairies. 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 4,000 liters of milk per cow per year. With on-farm herd replacement and an 80 percent calving rate, sixteen calves are produced each year. Twelve calves and four cull cows enter the beef market annually. Levels of productivity can vary according to the amounts of mixed rations fed to each cow (here 2 kilos per day) and to differences in herd and pasture management. Farmers who carefully monitor individual productivity and maintain high-quality cows in production can increase yield levels considerably.

Postfarm Activities

Milk in the Azores typically is 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 on 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 milk), dried milk, or cheese.

Since the major market is almost a 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 the production of liquid milk other than for Azorean use (including sales to the foreign bases located on the islands). The demand for liquid milk on the islands absorbs only 5 percent of local production (Table 7.2). Therefore, the two most interesting processing activities are those that either dry or curdle the milk before it is exported to mainland Portugal.

The drying process involves spraying the milk under pressure into a heated chamber and allowing the powder to collect at the bottom. Skim milk powder has virtually all of the cream removed; the cream therefore can be used in the making of butter. Eleven kilograms of milk are required to make a kilogram of skim milk powder. The fat content of this product is usually between 0.5 and 1 percent. The resulting butterfat byproduct can be converted into 672 grams of butter. Ten liters of raw milk (1 liter of milk equals 1.03 kilograms) thus yield 0.936 kilograms of skim milk powder and 0.405 kilograms of butter.

The main alternative to milk powder production is cheese production. One kilogram of cheese requires 10 to 11 liters of milk (depending on the type of cheese). The process of curdling milk to make cheese involves the introduction of rennets and other agents that accelerate the solidification of the curd, leaving a watery whey. The whey can be either fed directly to animals or dried, in a process similar to that used for milk, for animal feed. The curd is cut into shapes, compressed, and allowed to dry in a cold chamber. When dried or packaged, the cheese has a fat content of up to 45 percent.

Private and Social Profitability Results

The private profitability calculations strongly support initial impressions regarding the attractiveness of milk production in the Azores. The Azorean industry shows considerable profit in all system activities. Even with allowances for margin of error in cost estimates, both farmers and processors enjoy high returns on investment in dairy products (Table 7.3). When compared in terms of escudos per unit of raw milk, farm expenses are concentrated in the labor and tradable input categories. Labor costs reflect basic labor intensiveness in the pasturing of small cattle herds and in manual milking; the custom machinery services keep direct capital costs to a minimum. Tradable input costs predominantly involve outlays for fertilizers for pasture installation and maintenance. At a profit of Esc 8.98 per liter, a representative farm realized an income of over $US 4,000 in 1983, a significant amount when compared to other agricultural activities on both the islands and the mainland.

TABLE 7.3. *Private Costs, Revenues, and Returns for the Dairy System in the Azores, 1983 (in Escudos per 10 Liters of Milk)*

Item	Raw Milk on Farm	Skim Milk Powder (0.936 Kilograms) and Butter (0.405 Kilograms)	Cheese (1 Kilogram)
Total input costs	136.25	290.68	270.98
Raw material		188.10	188.10
Tradables	65.95	35.42	31.71
Factors	70.30	67.16	57.17
Labor	60.40	31.22	30.02
Capital	9.90	35.94	27.15
Revenues:	226.23	359.71	378.00
Main	188.10	359.71	378.00
Secondary	38.13	0	0
Returns to Land and Management	89.98	69.03	101.02

SOURCE: PES team estimates.

Processing profits per unit of raw milk are significantly higher than farm profits. Profit as a percentage of direct capital cost differs substantially between the two systems, ranging from 590 percent for cheese to 292 percent for skim milk powder and butter. These results indicate a disequilibrium in the processing sector in terms of the allocation of capital among processing activities. This disequilibrium is a result of the historical development of the dairy industry and the access to external markets. Given the wide difference in relative returns to capital, the expected response of the industry would be to shift resources into cheese production and out of drying. However, the market for Azorean cheese is limited largely to mainland Portugal because of a lack of transportation to other ports. Portuguese demand for cheese from the Azores is also limited. The drying activity, although much less profitable than cheese production, still earns an attractive return on capital. This return is due to the willingness on the part of the mainland Portuguese to pay a high price for the output (although again only for a limited quantity) and to the cost of the raw material (raw milk) set by the Azorean authorities. Because the price of raw milk is set specifically to ensure a high return on the drying operation, the more efficient cheese production is extremely profitable.

The results of the analysis of social profitability for the two systems are summarized in Table 7.4. Both systems were socially unprofitable in 1983, mainly because of low world prices for dairy products. In recent years, milk powder prices have been kept low by the action of countries that have been disposing of surplus dairy stocks on world markets. The last row of the table shows the breakeven output values (the world price levels at which there would be no social profits or losses). For the Azores to have a comparative advantage in skim milk powder and butter, the world valuation of the joint output would have to be Esc 208.60 per

TABLE 7.4. *Private and Social Costs, Revenues, Returns, and Policy Effects For Skim Milk Powder, Butter, and Cheese in the Azores, 1983 (in Escudos per 10 Liters of Milk)*

Item	Skim Milk Powder and Butter			Cheese		
	Private	Social	Policy Effects	Private	Social	Policy Effects
Total input costs	238.83	246.73	−7.90	225.13	227.70	−2.57
Tradable	101.37	104.89	−3.52	97.66	102.20	−4.54
Factors	137.46	141.84	−4.38	127.47	125.50	1.96
Labor	91.62	69.76	21.87	90.42	68.80	21.62
Capital	45.83	72.08	−26.25	37.05	56.70	−19.66
Revenues:	379.84	182.13	215.71	416.13	191.55	224.58
Main	359.71	144.00	215.71	378.00	153.42	224.58
Secondary	38.13	38.13	0.00	38.13	38.13	0.00
Returns to Land and Management	159.01	−64.60	223.61	191.00	−36.15	227.15
Breakeven output values[a]	200.70	208.60		187.00	189.57	

SOURCE: PES team estimates.
[a]Output value at which system profitability (private or social) equals zero.

kilogram (an increase of 45 percent). For cheese, the increase would have to be 24 percent. One of the most important consequences of Portugal's joining the EC is an alteration in Portugal's access to world markets. Imports have to be purchased at internal EC prices, since levy and duty receipts are paid over to the EC on goods originating outside it. Hence, if EC prices are above the breakeven output values shown in Table 7.4, these goods in the future will be produced efficiently in the Azores.

The Effects of Policies on the Dairy System

The differences between private and social costs and values represent policy effects both within and outside the dairy sector, in the absence of any notable market failures. These effects can be broken down into those that operate at the level of output prices, those that impinge on input markets, and those that create differences between social and private factor costs. Raw milk is not an internationally traded commodity. Hence, social valuations of dairying are meaningful only at the system level and policy effects can be identified only for systems, not activities. Table 7.4 gives the policy effects for the two dairy systems.

The primary policy effect is the assurance of markets in Portugal for Azorean milk powder and cheese at prices well above those in world markets. This price support effect is larger for cheese, at over Esc 224 per kilogram; skim milk powder and butter are at the slightly lower level of Esc 216. To the Azorean administration, this discrepancy in prices does

not represent a distortion in economic incentives, since there is no need to pay dairy processors the world market price if the actual market returns in Lisbon are substantially higher. The policy effect in this case is the result of mainland Portugual's dairy policy—the restriction on imports from other potential suppliers to the mainland—rather than of Azorean policy. The costs of a policy encouraging the production of dairy goods by pricing them above world market levels have to be viewed at the level of Portuguese agriculture as a whole. The context in which Azorean commodity policies must be evaluated changes as a result of EC membership. But the magnitude of the price policy effect is of interest in the general question of Azorean-mainland economic relationships.

The net effect of policies on material inputs in these systems is to reduce the costs of these inputs below levels that would obtain in the absence of policies. This net subsidy varies from Esc 8.46 per kilogram of cheese to Esc 7.44 per kilogram of skim milk powder and butter. Once again, the main policies causing this effect are those of the mainland government—the mixed-feed and fertilizer subsidies, offset in part by tariffs on imported capital equipment. Unless all the subsidies to local dairying are paid directly from Azorean tax funds, these transfers again are not necessarily a distortion of incentives from the point of view of the Azorean government.

Changes in Profitability in 1984

The costs and revenues of the 1983 systems and the farm-level activity are projected through 1996 using the assumptions described in chapters 3 and 4. The 1984 results, shown in Table 7.5, incorporate the major changes in input and output prices that were instituted in June 1983. For the Azorean systems, the important changes were the elimination of subsidies for fertilizers and fuel, leading to an 8 percent increase in tradable input costs at the farm level. To offset this increase, the farm price of milk was increased in real terms, from Esc 18.81 to Esc 22.24 per liter. The combination of these changes, along with the assumed 15 percent decrease in labor costs, led to an increase in farm-level profits of over 40 percent. For processed dairy products, the increase in the cost of raw material resulted in a 10 percent reduction in the profitability of cheese processing. However, the skim milk powder and butter price increases more than offset the higher raw material cost, resulting in a 36 percent increase in the skim milk powder and butter processing profits.

Changes in Profitability under the CAP

The effects of the changes in dairy product prices that will take place after EC accession are also shown in Table 7.5. It is assumed that the

domestic market prices for skim milk powder and butter in the Azores will be at the intervention level after accession, since the islands have been a surplus production area and will be likely to have an intervention center. Cheese prices rise to the threshold level as a result of protection from third-country competition. The Azores are surplus producers of cheese. But there is no intervention program for edam cheese, so the

TABLE 7.5. *Costs, Revenues, and Returns for Dairy Production in the Azores, 1983–96 (in Escudos per Unit of Final Product)*

(a) Skim Milk Powder and Butter

Item	1983	1984	1986	1987	1991	1996
Farm Level						
Total input costs	136.2	131.6	143.4	141.9	142.4	142.8
Tradables	66.0	71.0	76.4	73.9	70.1	64.6
Factors	70.3	60.6	67.0	68.0	72.3	78.2
Unskilled labor	0.0	0.0	0.0	0.0	0.0	0.0
Skilled labor	60.4	51.2	57.4	58.5	62.8	68.7
Capital	9.9	9.5	9.5	9.5	9.5	9.5
Revenues	226.2	260.5	256.7	239.9	234.2	224.4
Main	188.1	222.4	218.6	201.8	196.0	186.3
Secondary	38.1	38.1	38.1	38.1	38.1	38.1
Returns to Land and Management	90.0	128.9	113.3	98.0	91.8	81.6
System Level, Private						
Total input costs	238.8	228.0	243.0	242.1	244.8	248.2
Tradables	101.4	101.4	111.9	109.4	115.5	100.1
Factors	137.5	137.5	131.1	132.7	139.3	148.2
Unskilled labor	0.0	0.0	0.0	0.0	0.0	0.0
Skilled labor	91.6	91.6	87.1	88.7	95.3	109.2
Capital	45.8	45.8	44.0	44.0	44.0	44.0
Revenues	397.8	450.9	435.7	396.2	342.9	246.6
Main	359.7	412.8	397.5	358.1	304.7	204.4
Secondary	38.1	38.1	38.1	38.1	38.1	38.1
Returns to Land and Management	159.0	159.0	192.7	154.2	98.1	−5.7
System Level, Social						
Total input costs	246.7	233.0	239.8	240.1	249.7	251.0
Tradables	104.9	104.7	104.3	104.1	108.0	102.5
Factors	141.8	128.3	135.5	136.7	141.7	148.5
Unskilled labor	0.0	0.0	0.0	0.0	0.0	0.0
Skilled labor	69.8	59.1	66.3	67.5	72.5	79.3
Capital	72.1	69.2	69.2	69.2	69.2	69.2
Revenues	182.1	169.7	145.2	145.2	342.9	242.6
Main	144.0	131.6	107.0	107.1	304.7	204.4
Secondary	38.1	38.1	38.1	38.1	38.1	38.1
Returns to Land and Management	−64.6	−63.3	−94.7	−93.6	93.2	8.4
Policy Effect						
Private minus social	227.5	226.4	213.9	182.6	3.5	1.1

(*continued*)

TABLE 7.5. (*Continued*)

(b) Edam Cheese

Item	1983	1984	1986	1987	1991	1996
Farm Level						
Total input costs	136.8	131.6	143.4	141.9	142.4	142.8
Tradables	66.0	71.0	76.4	73.9	70.1	64.6
Factors	70.3	60.7	67.0	68.0	72.3	78.2
Unskilled labor	0.0	0.0	0.0	0.0	0.0	0.0
Skilled labor	60.4	51.2	57.4	58.5	62.8	68.7
Capital	9.9	9.5	9.5	9.5	9.5	9.5
Revenues	226.2	260.5	256.7	239.9	234.2	224.4
Main	188.1	222.4	218.6	201.8	196.0	186.3
Secondary	38.1	38.1	38.1	38.1	38.1	38.1
Returns to Land and Management	90.0	128.9	113.3	98.0	91.8	81.6
System Level, Private						
Total input costs	225.1	214.8	229.7	228.7	231.4	234.7
Tradables	97.7	102.7	108.2	105.6	101.8	96.3
Factors	127.5	112.2	121.6	123.1	129.6	138.4
Unskilled labor	0.0	0.0	0.0	0.0	0.0	0.0
Skilled labor	90.4	76.6	84.5	87.5	94.0	102.8
Capital	37.0	35.6	35.6	35.6	35.6	35.6
Revenues	416.1	434.5	405.7	369.2	319.5	259.6
Main	378.0	396.4	367.6	331.1	281.4	221.4
Secondary	38.1	38.1	38.1	38.1	38.1	38.1
Returns to Land and Management	191.0	219.7	179.9	140.5	88.1	24.9
System Level, Social						
Total input costs	231.6	214.7	221.4	222.4	231.2	232.5
Tradables	106.1	102.0	101.6	101.4	105.3	99.8
Factors	125.5	112.7	119.9	121.1	126.0	132.7
Unskilled labor	0.0	0.0	0.0	0.0	0.0	0.0
Skilled labor	68.8	58.3	65.4	66.6	71.5	78.2
Capital	56.7	54.4	54.4	54.4	54.4	54.4
Revenues	191.6	175.8	151.3	151.5	319.5	259.6
Main	153.4	137.7	113.1	153.4	281.4	221.4
Secondary	38.1	38.1	38.1	38.1	38.1	38.1
Returns to Land and Management	−40.1	−38.9	−70.2	−71.0	88.3	27.1
Policy Effect						
Private minus social	231.08	229.23	208.36	170.02	−1.82	−4.14

SOURCE: PES team estimates.

Azorean producers must bear the cost of transportation to continental European markets.

Table 7.5 shows that private profitability for both systems decreases on accession and will continue to fall through 1996. The cheese system will remain profitable throughout the period, but the skim milk powder and butter system will turn slightly negative at the end of the transition.

Both systems are socially unprofitable at entry and will continue to be so through 1990—the end of the first stage of the transition. In the following year, as CAP prices for agricultural commodities replace world levels in social valuation, social profitability for both systems will turn substantially positive. The large increase in the social valuation of the output, 150 percent for cheese and 186 percent for skim milk powder and butter, will more than offset a modest increase in the social cost of mixed feed.

The difference between private and social profit is the net effect of policies on the system. Through 1990, the major component will be a subsidy on the value of the output. After 1990, the very small net policy effect will be due only to the EC's Common Customs Tariff (CCT) on nonagricultural imports and to domestic factor policies.

Changes in the Raw-Milk Market

Two major issues facing the Azorean dairy industry after accession are how the price of raw milk will be determined and at what level it will be. Under strict application of the CAP dairy regime, there is no direct support of the raw milk price. Intervention and trade protection occur in the markets for processed products. In the Azores, market support through intervention buying will take place only in the skim milk powder and butter markets. There will be an intervention buying center in the Azores, since the islands constitute an area of surplus production. Therefore, domestic producers will not have to pay transport costs to mainland intervention points.

Intervention prices for skim milk powder and butter are derived from, and designed to support, the fixed target price for raw milk. Representative industry processing margins per unit of milk processed for skim milk powder and butter are added on to the desired floor price for milk (usually 94 to 96 percent of the target price) to obtain the corresponding total value of the joint production of these two outputs. The intervention prices for skim milk powder and butter are set equal to this total value of the joint output. There is freedom in this calculation to alter the relative price of fat to nonfat solids. The assumptions underlying the calculation are that the margins used represent actual industry costs and that competition among processors for raw material will ensure that the price of milk will be bid up to at least the floor level built into the calculation.

For the 1983–84 marketing year, the margins used to calculate intervention prices were 28.43 ECUs per 100 kilograms of butter and 22.90 ECUs per 100 kilograms of skim milk powder. Given the conversion ratios for the skim milk powder and butter system, these margins correspond to 0.3199 ECUs, or Esc 34.82 (Esc 108.844 per ECU), per 10 liters of milk processed. The processing costs reported by the Azorean industry

for skim milk powder and butter were Esc 66.88 per 10 liters of raw milk, a figure 92 percent higher than that used to calculate the EC intervention prices. Given these processing costs and the intervention price levels for outputs, the Azorean industry would be willing to pay only a much lower price for raw milk.

Two explanations for the high processing margin have been provided by industry officials. The first is that energy costs, which are an important input in the drying process, are very high in the Azores. Fuel and energy represent 25 percent of the total cost of the skim milk powder and butter processing activity. A comparison of the energy costs of cheese production for the Azores and the mainland indicates that in this activity the fuel costs per unit are 57 percent higher in the Azores.

The second explanation is that a large amount of excess drying capacity exists in the Azores, leading to high per unit fixed costs. In 1983, the fixed costs (interest and depreciation plus 20 percent of labor costs) were Esc 23.85, out of total per unit costs of Esc 66.88. The remaining variable-cost component, 43.03, is itself larger than the total margin used in the EC intervention price calculation. Hence, increasing capacity utilization alone cannot reduce Azorean processing margins to EC levels. Reductions in the variable-cost components are also necessary.

The Azoreans have taken this problem into consideration in their negotiations with the EC. They have suggested that within the CAP the Azorean skim milk powder intervention price be calculated using Azorean rather than European processing margins. Then, in the succeeding five years of the first stage of transition, these margins would be harmonized to the EC level. The raw milk price would be fixed directly in the first transition stage. The hope is that the Azorean processing industry will be able to reduce its costs substantially during that time.

Unless the skim milk powder and butter processing margins are reduced from their present levels, cheese production will continue to be a more profitable activity. If Azorean producers could gain access to European markets by improved shipping services, cheese production could expand at the expense of skim milk powder production. With this change, the derived price for raw milk (the value of the output minus the processing margin) would be determined by the cheese activity and would be higher than the derived price of the skim milk powder and butter activity.

Another factor influencing the price of raw milk in the second transition stage will be the degree of competition in the raw milk market. Currently, the price of raw milk is legislatively determined (it is fixed during the first transition stage). Under the CAP dairy regime, however, the price of raw milk is supposed to be determined through market forces. In European markets, competition among processors keeps the raw milk price at or above the floor price, as determined in the intervention price

calculation. Given the small number of processors in the Azores, there is some question whether competition for raw material will tend to bid the raw milk price up to the CAP price, thereby reducing the large profits that processors now receive. Azorean authorities could alleviate this potential problem by legislating that producers receive the CAP target price over the entire transition period. This legislation would transfer to the farm level all system profits not included in the intervention price margin calculations.

Conclusions

Dairying, both as a farming activity and at the processing level, is a very profitable endeavor in the Azores. Although the islands provide favorable climatic conditions for production, this profitability is due to large subsidies to the industry, principally on the value of output. When valued in social terms, dairying in the Azores is inefficient. This somewhat surprising result is due almost entirely to the fact that world prices are depressed because of large and growing distress sales and large worldwide stocks of dairy products.

This bleak assessment of the Azorean dairy sector alters dramatically when Portugal joins the EC. As a result of membership, the social valuations of the outputs will increase to the European price level. In this Euro-social context, the Azorean cheese production system will be socially profitable through 1996. If skim milk powder and butter processing costs are reduced to EC levels in the future, this system also can remain profitable over the transition period. Under the economic conditions imposed by EC membership, dairying will become an efficient activity.

Several issues concerning changes in private profitability emerge as a result of membership. First, pricing decisions will be made at the EC level, and the most likely trend of future prices is downward in real terms. Second, Azorean prices for the major dairy products will have to harmonize to lower EC levels. This harmonization implies more substantial real price declines in the medium term. However, even these adverse price movements will not eliminate all of the private profits of the Azorean systems.

Third, the method of determining the raw milk price will change, and the exact price level that farmers will receive will depend on the ability of the processing industry to adjust to new market conditions. If the intervention prices for skim milk powder and butter are to defend the EC floor price, the processing margins will have to decrease to roughly half their present levels. This magnitude of per unit cost reduction cannot be made by increased capacity utilization alone; variable costs will also have to decrease. However, if transportation to European ports becomes avail-

able at reasonable cost, cheese production for export could increase and, because of its lower processing margin, could bid up the price of milk. Furthermore, as the controls on the raw-milk price are eliminated, competition for raw material could increase the price of raw milk and transfer some of the processor-level profits to the farm level.

Dairying is expected to remain privately profitable in the Azores, even with falling real prices of dairy products. The distribution of future profits between farmers and processors is uncertain, however. Their relative shares will depend on the operation of the local market for raw milk, the expansion of export markets for cheese, and the ability of the processing industry to reduce costs.

8. Intensive Agriculture in the Northwest

by Timothy J. Finan

The pattern of large grain farms found south of the Tagus River changes dramatically in Portugal's northern regions. There the land rises gradually from a relatively flat strip along the Atlantic coast through a transition zone to a mountainous landscape cut by wide valleys. The agriculture of the North is characteristically small-scale and intensive, relying primarily on family labor. The North is also distinguished west to east by major differences in agricultural land use. This chapter focuses on the intensive patterns of farming in the Northwest, a region facing major pressures for change.

The Northwest is comprised of two administrative regions—the Beira Litoral and the Entre Douro e Minho. They account for about 17 percent of Portugal's land area but almost 43 percent of its population (INE 1983, 21). About 35 percent of northwestern inhabitants live on farms, and agriculture employs nearly 20 percent of the economically active population. Few indicators of regional economic well-being are available; however, the small average farm size (2.5 hectares), productivity levels that lag far behind those of western Europe, and low rural salaries suggest low income levels for farm families. In the past, emigration from the Northwest to industrialized Europe has been heavy, and emigrant remittances helped increase income levels. However, emigration possibilities have been curtailed sharply during the last ten years, and rural poverty remains a major social problem for the region.

With its favorable climatic conditions, the Northwest plays an important role in national agricultural production. As Table 8.1 indicates, the region accounts for around 75 percent of the mainland supply of both corn for grain and milk, nearly half the potatoes, and all the *vinho verde* (and much of the port, as well as some low-quality wines). These commodities are produced predominantly on small, highly fragmented farms. Over 90 percent of regional farms have fewer than 4 hectares of farmland, and these small farms account for about 75 percent of regional agricultural production (Carvalho 1985). Production technology varies substantially from primarily subsistence units to larger farms that use a modern and sophisticated technological package. The technological modernization of

TABLE 8.1. *Production Data of the Northwest, 1983*

Commodity	Northwest	Mainland Portugal	Northwest Share (Percent)
Corn as grain (in metric tons)	321,874	424,357	75.8
Potatoes (in metric tons)	409,940	905,302	45.3
Vinho verde (in hectoliters)	1,345,761	1,346,761	100.0
Raw milk (in hectoliters)[a]	5,426,493	7,083,510	76.1

SOURCE: Instituto Nacional de Estatística (INE), *Estatísticas Agrícolas* (Lisbon, 1983).
[a]1980 production figures.

small farms in the Northwest is a critical prerequisite for increasing yields and farm incomes.

Agricultural policy—affecting both prices and structural adjustments—has a far-reaching influence on the direction of agricultural change. In this chapter, several commodity systems with alternative technologies are analyzed with respect to private and social profitability. System descriptions of commodity activities incorporate to the extent possible the characteristics of the whole farm from which the analyzed commodities have been extracted. From these results, the impacts of a set of 1983 agricultural policies are estimated and the effects of joining the European Community are considered.

Dairy Systems

The production of milk and its by-product, calves, is the most important commercial activity on many farms in the Northwest. Milk sales are the single largest and most dependable source of farm income in many parts of the region, and farmers often refer to their milk checks as "the salary." In the higher altitudes and in valleys to the east of the region, milk production declines in importance. A regionwide estimate of the number of Northwest farms that produce milk falls between 80,000 and 100,000, or about 30 percent of all farms (MACP-BL 1983; Mendes 1985). The volume of milk production more than doubled during the period 1966–79, and about three-fourths of that increase occurred on farms with fewer than five cows (Carvalho et al. 1982, 49). For individual farm households and national consumers, the increase in northwestern dairying has wrought profound changes.

An aggressive agricultural policy in the Northwest's dairy sector created the incentives for growth in milk production. In the early 1970s, the government designated most of the region as the national milkshed and decreed a set of policy supports that included fixed prices and input subsidies. Of particular importance was the role delegated to the cooper-

ative system as the representative of small and medium-size farms. The individual cooperatives and their federated organizations (unions) were granted exclusive pickup and delivery rights for raw milk produced in the milkshed, and they received a fixed margin payment for each liter of milk transported and processed into pasteurized milk. By providing dairy farmers with both a fixed price and a guaranteed market, the policy proved very successful in expanding milk production.

In this study, four dairy systems are defined and analyzed. The traditional general system produces milk with multipurpose work cows and small amounts of land. It is useful to think of the traditional farm as a base to be modified by technological alternatives. One alternative, the small milk system, has the same amount of cultivated area as the traditional system, but work cows are replaced by dairy cows and cropping patterns are altered. The third system, the medium milk system, incorporates increases in both herd and land size and changes in cropping technologies. The fourth system, the large milk system, represents specialization in dairying. The production characteristics of all four systems are summarized in Table 8.2.

Traditional Milk System

The traditional farm characterized in this study occurs throughout the Northwest but is predominant in the higher transition zones and in the mountain valley areas. This landholding has 1 hectare of cultivated area, on which a corn/bean mixture is rotated with winter forages. Corn is the central crop in the rotation because of its multiple uses both for family consumption (as the bread *broa*) and as animal feed. Forage crops—commonly, ryegrass—are fed to the cattle first as green fodder, later as hay. The traditional farm also produces small amounts of wine grapes, potatoes, and rye for bread and seed.

The basic farm technology in the traditional system is labor-intensive. Whenever possible, the traditional farmer maximizes the use of family and exchange labor in the production process. Available labor is also used for making capital improvements, such as heavy manuring of fields, in order to minimize the reliance on purchased inputs. The traditional farm depends on animals for both transportation and field traction. Two multipurpose work cows are assumed to provide several hundred hours of draft power as well as 1,000 liters of milk per year. They also produce calves that, after six months, are sold to beef producers.

The milk of these autochthonous cattle breeds has a higher butterfat content than that of modern breeds, thus increasing its value. These rustic and hardy breeds are fed entirely with feed produced on the farm and require little of the more sophisticated management afforded the Holstein and Frisian cattle. Characteristically, the work animals are kept

TABLE 8.2. *Production Characteristics of Farm Activities in the Northwest, 1983*[a]

Activity	Labor Hours	Machine Hours	Fertilizer (in Kilograms) Nitrogen	Phosphorus	Potassium	Main Yields	Types of By-Products
Traditional milk system						2,000 liters	Calves, culls
Regional corn	806.5	6.5	71.8	0.0	0.0	3,000 kilos	Fodder, beans
Forages	866.0	0.0	61.5	0.0	0.0	30,000 kilos	—
Small milk system						6,800 liters	Calves, culls
Hybrid corn	986.5	39.0	110.0	56.0	56.0	4,000 kilos	Fodder, beans
Forages	582.0	14.0	61.5	0.0	0.0	30,000 kilos	—
Medium milk system						48,000 liters	Calves, culls
Corn silage	125.5	85.5	192.5	90.0	90.0	40,000 kilos	—
Forages	312.5	67.0	123.0	45.0	0.0	30,000 kilos	—
Large milk system						180,000 liters	Calves, culls
Corn silage	97.0	99.0	257.0	98.0	98.0	50,000 kilos	—
Forages	186.0	71.5	234.0	90.0	0.0	60,000 kilos	—
Pasture	350.0	97.8	0.0	180.0	180.0	85,000 kilos	—
Potatoes							
Traditional	861.5	6.5	140.0	140.0	140.0	15,000 kilos	—
Medium	550.0	109.5	140.0	140.0	140.0	20,000 kilos	—
Large	550.0	111.5	140.0	140.0	140.0	20,000 kilos	—
Wine[b]							
Ramada	985.0	0.0	0.0	0.0	0.0	11,000 kilos	Brandy
Cordão	484.0	66.0	94.5	49.0	49.0	10,000 kilos	Brandy

SOURCE: PES team estimates.
— = not applicable.
[a]Milk systems measured in herds; corn, forages, pasture, potatoes, and wine measured in hectares.
[b]The wine systems analyzed here are built on two farm activities, one of which has two different processing activities.

in stables under the farm residence and milked once a day for about 200 days after calving. The milk then goes to cooperative reception posts for transport to processing plants. The cows see the light of day only when harnessed for work.

Small Milk System

The small milk system represents the first step toward modernization and greater market integration. At the farm level, the two traditional cows are replaced by modern dairy cows, which are more productive but also have larger feed and management requirements. The land size of the farms remains at 1 hectare, but on-farm technology changes significantly. Although the small milk farm does not reduce the diversity of its output, it adopts a standard C_4 technology of hybrid corn seed (instead of the regional varieties), limestone for soil acidity, and higher levels of fertilizer. With the increased yields of corn for grain and fodder, the small dairy farmers can support a herd of two dairy cows. Small amounts of mixed feed supplement the on-farm inputs, and farmers use artificial insemination to control herd quality.

The substitution of dairy for work cows means higher income from milk. The higher-yielding dairy breeds more than triple the production of traditional work cows. However, the small milk farmer loses animal traction on a farm still too small to mechanize. One solution to this problem is for the farmer to change completely to custom machinery services. This innovation has occurred widely where rural industry has absorbed local labor supplies.

Small milk farmers use collective milking parlors, perhaps the most innovative component of dairy policy. These parlors, owned by either local cooperatives or their unions, are used by small farmers located within a 1 or 2 kilometer radius of them. The cows are milked twice a day at the collective parlor, which in most cases has a refrigerated bulk tank. Besides offering a guaranteed market, the collective parlor also helps maintain milk quality and animal hygiene standards.

Medium Milk System

The medium milk system approximates the ideal dairy farm currently envisaged by Ministry of Agriculture technicians. Each farm has 3 hectares of cultivated land supporting a herd of twelve dairy cows. As with the smaller systems, the farm does not sacrifice crop diversity; it continues to produce potatoes and wine. Nondairy products are destined primarily for family consumption.

The medium milk system entails two major technological alterations. First, the basic feeding regime of corn grain is replaced by corn silage.

This dramatic change requires a substantial investment in capital, including machinery and a silo, cow barn, and corral. Farmers without experience in storing silage also find this method more risky than storing corn grain. As in the other systems, corn is followed by a forage mix in the winter rotation. The second major technological alteration involves increasing the degree of mechanization. Labor hours are drastically reduced by the substitution of machine time and increased use of purchased inputs such as herbicides.

The improvements in feed quality and increases in mixed feed usage raise milk yields to 4,000 liters per cow-year. Moreover, the farmer invests more in veterinary care and herd management. As before, carefully selected farm calves form the replacement reserves, and surplus calves are marketed at less than one month of age. The medium dairy farm also has its own milk parlor with refrigerated bulk tank, which cooperative trucks empty on a regular schedule. This type of farm accounts for about 4 percent of the total number of farms in the region.

Large Milk System

The representative farm in the large milk system takes a major step toward specialization. This farm does not produce corn grain or wine, and with the single exception of a 0.5 hectare potato field, all land resources are allocated to cattle feed. The farm has 10 hectares of cultivated land and a milking herd of thirty-six cows. The number of large milk farms is less than 1 percent of total milk farms, and the farms tend to be located along the coastal region of the Northwest, where relatively flat land and larger parcels permit easier mechanization.

In addition to corn silage and ryegrass for fodder and hay, the large milk farm produces 3 hectares of permanent pasture with mixed legume forages. To intensify the productivity of these pastures, the fodder is cut and taken to the cow barns to avoid trampling damage by grazing animals. The cattle are also fed larger quantities of mixed feeds. In response to this feeding regime, the cows achieve an annual average yield of 5,000 liters of milk. Innovations in herd management also contribute to yield improvements. The useful life of each cow is reduced to six years; for genetic quality control, only the best bull semen is purchased for artificial insemination; and veterinary care is at high levels. The cattle are milked in a private parlor that contains modern refrigeration equipment. Large farmers have significant contact with the cooperative unions, the extension service, and agricultural input firms.

The large milk system is totally mechanized. In constrast to the other systems, abundant land resources permit a fuller utilization of machine capacity. The large farm typically requires full-time salaried laborers to complement available family labor.

Private Profitability of Dairy Systems

Several characteristics distinguish the nature of dairy farming under alternative technologies (Table 8.2). The traditional farm relies on its most abundant resource, labor, and seeks to minimize cash outlays for purchased inputs. Only about one-third of the core rotation crop, corn, is converted to milk, since the traditional farmer also uses grain for small domestic animals and home consumption. In the small milk system, purchased input use increases, and although the farmer reduces some labor requirements by contracting for custom machines, the activity is still very labor-intensive. Yields are higher than in the traditional system, but a similar percentage of corn grain is converted to milk. The movement toward dairy specialization remains incomplete, since the farmer incorporates technological innovation without abandoning the goal of production diversity. In the medium and large systems, the structure of farming undergoes irrevocable change; labor time drops significantly, capital costs increase, and the commitment to dairy production entails full integration into the dairy market.

These differences in the dairy systems are depicted in the private profitability results in Table 8.3. Private profit is a measure of the competitiveness of a given commodity under current market prices. Activities that are unprofitable at private prices thus face pressures for resource readjustment toward more favorable alternatives. For the 1983 base case, the shift to technologies that both increase dairy specialization and intensify the use of capital and purchased inputs results in improved profits for milk farmers in the Northwest.

The traditional milk system has the most negative results. However, milk production under this low-yielding technology should be interpreted within the context of the set of products the work animals provide. The principal functions of traditional work breeds are to provide field traction and transport, and the value of these activities is difficult to estimate as a by-product within the milk system. In reality, traditional farmers consider milk to be the by-product of their traction animals, and some breeds are not milked at all. Consequently, this technology produces milk at very low returns to factors, primarily labor, which helps explain the readiness of farmers to switch from work animals to dairy breeds.

The change to dairy animals more than triples milk revenues to the farmer and reduces the 1983 negative private profit by over 85 percent. The significant improvement in small milk system profits results primarily from the dramatically increased milk output on the same small land area. The technology is still highly labor-intensive, and labor costs account for 68 percent of total costs. Although private profits remain slightly negative (about 12 percent of output value), the small milk system is economically preferable to the traditional milk system.

TABLE 8.3. *Private Costs, Revenues, and Returns for Representative Agricultural Systems in the Northwest, 1983 (in Escudos per Liter for Dairy and Wine Systems and Escudos per Kilo for Field-Crop Systems)*

System	Yield[a]	Costs			Revenues		Returns to Land and Management
		Labor	Capital	Tradable Inputs	Main	By-Product	
Dairy							
Traditional milk	2,000	49.8	14.7	6.6	22.6	25.6	−22.9
Small milk	6,800	20.6	5.0	4.6	21.7	5.1	−3.4
Medium milk	48,000	5.6	7.6	9.9	21.7	5.5	4.1
Large milk	180,000	4.4	7.4	11.3	21.7	4.5	3.1
Field-crop							
Regional corn	3,000	20.6	7.4	5.7	23.0	10.5	−0.2
Hybrid corn	4,000	20.0	5.8	6.0	23.0	12.8	2.4
Traditional potato	15,000	4.3	1.3	6.2	15.0	0.0	3.2
Medium potato	20,000	2.5	3.1	6.4	15.0	0.0	3.1
Large potato	20,000	2.5	2.2	6.5	15.0	0.0	3.9
Wine							
Ramada-home	8,250	10.2	9.8	3.3	18.2	0.0	−5.3
Ramada-cooperative	8,250	10.6	10.1	3.7	27.4	0.0	3.4
Cordão-cooperative	7,500	6.0	7.6	6.0	52.2	0.0	32.5

SOURCE: PES team estimates.

[a]Liters per herd for dairy system; kilograms per hectare for field-crop system; liters per hectare for wine system.

The medium and large milk systems have positive profits. In both systems, labor is reduced to under a quarter of total costs and tradable inputs increase to approximately one-half. The relative shift in input intensity results in greater feed availability per land unit and, consequently, higher milk yields. The medium and large milk systems are largely mechanized, and the value of output per labor input in the large milk activity is nearly five times higher than in the small milk activity.

From the perspective of private profit, the dairy systems illustrate the advantages of modernization of farm technologies. That approximately half the farmers in the Northwest remain traditional farmers raises questions regarding the constraints on change in the dairy sector. A strong flow of resources out of the traditional milk system and into the small milk system has occurred. But some traditional farmers, especially those in some mountainous areas, find the loss of animal traction too serious an obstacle to overcome, and others do not have access to market incentives such as the collective milking parlor. The movement from small to medium and large milk systems encounters both capital and land constraints. The nature of these constraints and the adjustments necessary to relieve them are discussed in chapters 10 and 11.

Field-Crop Systems

Of the several crops intensively cultivated on northwestern farms, corn and potatoes have the greatest economic importance. Virtually all northwestern farms devote at least some cultivated area to these crops, since they are staples in the regional rural diet, are marketed for income, and are fed to domestic animals. Three-fourths of Portugal's corn and half of its potatoes are produced in the Northwest (Table 8.1). The production activities can be characterized with two technology choices for corn and three for potatoes.

The introduction of corn into the Northwest nearly four centuries ago revolutionized an agriculture then based on other cereals and grapes. During the last two decades, hybrid varieties have been introduced throughout parts of the region; Carvalho (1985, 32) estimates that about 20 percent of the corn planted in the Entre Douro e Minho is hybrid seed. The introduction of hybrid corn is part of a larger technological package that includes correction of soil acidity and increased levels of chemical fertilization. The first of the two representative corn systems is the traditional system, which uses regional seed and few purchased inputs. The second system is the hybrid system; it uses a modern technology of hybrid seed, limestone, and a full complement of fertilizers.

Both corn systems require large quantities of labor. In most areas, fields are prepared with custom machinery. But all other tasks, including

weeding, thinning, irrigation, harvesting, and post-harvest care, utilize labor. No labor savings are realized in the hybrid corn system. The improved technology—with higher levels of purchased inputs—makes more intensive use of land and labor to increase yields

The switch to hybrid corn varieties tends to occur with the intensification of dairying activities. On the small milk farm, hybrid corn is used primarily as animal feed for cattle and other domestic animals. The green corn fodder also provides a needed source of feed during summer months. Medium and large milk farms use hybrid seed to produce corn silage.

Potatoes are grown as a staple food crop destined for both home consumption and market sales. Portugal's per capita consumption in 1983 was over 101 kilograms, among the highest amounts in Europe. Most of the 400,000 tons of northwestern potatoes are produced on small farms (Carvalho 1985, 171). A well-tended potato patch provides the average farm family with its consumption needs, some animal feed, and limited market sales. In some areas, however, potatoes compete with corn and thus indirectly with milk. Particularly in the coastal region, many farmers easily shift resources between milk (corn) and potatoes in response to changes in relative prices. Corn and potatoes use the same quality of land, and their planting seasons are virtually identical.

Northwestern potato technologies differ by input intensity, degree of mechanization, and use of certified seed. Potato farming under a traditional system uses animal traction for all activities except land preparation. Potatoes are planted in early spring and harvested during the summer. A major technological distinction involves the type of seed planted. The traditional farm does not purchase all the seed potatoes needed for planting but instead retains a proportion of its previous harvest. Farmers realize that second-generation potato seed reduces yields, but they know that it also reduces purchased input costs, a major concern among traditional producers. Even under the traditional technology, farmers apply chemical fertilizers along with heavy doses of manure. Although potato plants do not demand frequent irrigation, the crop must be defended against damaging fungi and pests on a regular basis. For this defense, most traditional farmers own a motorized backpack sprayer. The traditional system uses large amounts of labor, especially in harvesting.

The technological alternatives, medium and large potato systems, substitute capital for labor. Fertilizer usage remains the same. However, the medium and large farms use only purchased seed potatoes; they do not retain seed from the previous year. Yields increase to 20,000 kilos, or 33 percent over the traditional system. The large potato system differs from the medium primarily in per-unit machinery costs and farm size. The large potato system is used on farms with larger areas; therefore, the total hours of machine use are greater and capital costs are proportionately

lower. Although a limited number of specialized potato farms are found in coastal areas near urban centers, most northwestern production comes from small farmers using traditional technologies.

Private Profitability of Field Crops

The input-intensive technology associated with the hybrid corn system increases private profit over that of the traditional alternative. Although the traditional technology achieves a breakeven profit level, the hybrid corn technology has a private profitability of about 10 percent of output value (Table 8.3). The relative proportions of labor used to produce both regional and hybrid varieties remain similar, but the relative share of tradables to total costs is 40 percent higher for the hybrid corn system. Yield improvements in both grain and green fodder result in an increased output value that more than offsets additional input costs. The slow dissemination of hybrid varieties throughout the region has been interpreted by Carvalho (1985) as the result of a water constraint. Where traditional irrigation systems do not provide adequate water on a regular basis, the regional corn varieties can perform better. In addition, domestically produced hybrid varieties vary widely in quality, an added risk factor that influences farmers' adoption rates.

Potato commodity systems under all technologies enjoy a private profitability of between 20 and 25 percent of output value. The average production costs do not change significantly from the traditional technology to the more modern ones, primarily because even the traditional farmers have adopted recommended fertilizer levels and the basic labor-saving implement, the potato digger. The additional cost in the medium and large systems of purchasing certified potato seed is compensated by increments in yields.

The important question raised by these results is why more resources do not flow into potato production. High profit levels would seem to create incentives to specialize heavily in potatoes, a specialization that occurs only in a limited area in the Beira Litoral. The answer lies mainly in the production and marketing risks associated with potato production. The price for potatoes tends to fluctuate widely, and no program of guaranteed prices exists for farmers. Carvalho (1985) reports that in the beginning of 1975, the Fruit Marketing Board (the Junta Nacional das Frutas, or JNF) intervened in the market and acquired 7 percent of production in order to prevent falling prices. However, during the following campaign, the JNF imported 60,000 tons of potatoes. Subsequently, government intervention has become less frequent, and sharp price variation has continued. The other risk involves disease. Potatoes are very susceptible to a wide array of soil-borne diseases and cannot be produced safely on the same area over consecutive years. Farmers acknowledge the problem

of potential falling yields and move their potato plantings from field to field. This practice requires a relatively large amount of land relative to the potato patch in order to permit safe rotation patterns. The small size of northwestern farms thus poses a constraint to significant expansion of potato production.

Wine Systems

The designated regions of *vinho verde* include all of the Entre Douro e Minho and a portion of the northern Beira Litoral. An estimated 212,000 producers have vineyards that produced nearly 46 million liters of wine in 1984. Farmers with production levels of 5,000 or fewer liters (about 8,000 square meters of vines) account for almost half of total production (CVRVV 1984). The low-alcohol *vinho verde* is both a widely consumed household drink and an important market commodity. In several of the river valleys of the Northwest, wine (rather than milk) production is the principal agricultural activity.

Vinho verde grapes traditionally are grown on elevated arbors called *ramadas*. The arbors are about 3 meters high and 4 meters wide and form the edges of farm parcels and cultivated terraces. They are supported by stone columns with iron crossbars connected by steel wires. Well- maintained ones will last for several decades. *Ramadas* represent an ingenious response to land constraints by allowing a vertical agriculture. Many structures are designed to allow for maximum insolation, and farmers take advantage of the area underneath the supports to plant animal fodder or vegetables for the family.

Traditionally, farmers have processed *vinho verde* in their own homes. Virtually every farmhouse has its own winery and cellar. Most farmers market their wine to local wholesalers for regional distribution. In contrast to the traditional pattern, a small number of private firms produce nationally marketed quality wines from their own grapes or the grapes of other farmers.

Around 70 percent of the *vinho verde* produced in the region is red wine. Recently, however, the market has begun to offer a premium price for white wines, and many small farmers have responded to this incentive by shifting from red to white grape varieties. Much of the change has been promoted by the cooperative wineries. Although the majority of *vinho verde* is still home-processed, the cooperatives have begun to seek a wider share of the domestic market. In 1983, they marketed only about 5 percent of the total *vinho verde* sold. The cooperatives offer small farmers a quality-control alternative to home processing and are expected to play a key role in the modernization of the wine sector.

The technological alternatives to traditional wine systems combine

both production and processing changes. The recommended production techniques focus on a shift away from arbor-style vineyards to those of continuous fields of short, vertical trellises that permit easy mechanization of the production process—the *cordão* system (Table 8.2). Vineyard management under the *ramada* system requires concentrated periods of high labor use—first for pruning, then for harvesting. The *cordão* system reduces labor by making both the vineyards and the grapes more accessible. However, the costs of *cordão* vineyard construction are high, and the *cordão* system involves less-intensive land use. Average yields fall from 8,250 liters of wine per *ramada* hectare to 7,500 liters per *cordão* hectare, a decrease of 10 percent. In processing, the choices involve home wine making or the use of the cooperative wineries. The switch to selected white grape varieties is assumed to involve the use of cooperative winery facilities for most farmers, since the cooperatives are becoming important marketing outlets for small farmers who produce grapes for quality wines.

This analysis considers three different wine systems. The first, labeled traditional (*ramada*-home in Table 8.3), depicts the most widespread and basic wine technology. Grapes are produced and processed on the traditional farm, and the marketed wine—90 percent red *vinho verde*—is sold to local merchants. The second, one of the technological alternatives (*ramada*-cooperative in Table 8.3), occurs primarily in the areas well adapted to grape production. The proportion of red grapes remains at 90 percent, but all the grapes are processed in the local cooperative. Grape-growing technology does not change; nor do yields. But the cooperative winery processes the grapes into higher-quality wines. The third, another technological alternative (*cordão*-cooperative in Table 8.3), also uses the cooperative winery for its processing but produces grapes under the *cordão* system. This modern system is assumed to produce 90 percent white varieties and 10 percent red. The system is totally integrated into the market, and little concern is given to wine produced specifically for home consumption.

Private Profitability of Wine Systems

Profit changes in the wine systems reflect differences in the quality of the *vinho verde*. Production technologies for *ramada*-home and *ramada*-cooperative grapes differ only in the proportions of the low-valued red grapes to the higher-valued white ones. Refined processing technologies practiced in the wine cooperatives, however, result in a *vinho verde* that is over 50 percent more valuable than the home-processed product. The output of the *cordão* system is 90 percent white wine through the cooperative, a product almost three times more lucrative than home-processed wine. The *cordão* system reduces labor costs because of easier access to the vineyards and higher levels of mechanization. Profit levels of 60 per-

cent (assuming all profit accrues to producers) make this system the most attractive one in the Northwest.

Rapid expansion of the *cordão* system throughout the Northwest is constrained by both financial and ecological factors. The investment costs for planting *cordão* vineyards are very high, and returns begin to be realized only after several years. Most farmers do not possess the savings or the access to credit necessary to make the costly changes. Furthermore, under the diversified production schemes characteristic of small farms, a large, continuous vineyard of the *cordão* type represents a risky specialization in production. Risk-averse farmers prefer to make a shift to more white grape varieties of high quality by substituting them for old red grape vines. Legal and ecological restrictions also limit the potential expansion of *vinho verde* vineyards.

Social Profitability and Policy Effects

Social profitability is a measure of the efficiency of production, processing, and marketing. For estimating the opportunity cost of a commodity, a traded good with a world price is required (chapter 2). Three of the basic northwestern commodities—corn, potatoes, and *vinho verde*—have international markets; profitability analysis thus includes the social costs of transportation to the nearest port where a world price prevails. Since liquid milk customarily is not traded, the dairy system profitability incorporates the social costs of processing liquid milk into a traded commodity—edam cheese.

Only the potato systems and the wine *cordão* system show positive social profits. As Table 8.4 indicates, the positive private profits of the more modern dairy, hybrid-corn, and *ramada*-cooperative wine systems turn negative once government policy support is removed. The privately negative systems become even more negative when costs and returns are socially evaluated.

The results demonstrate that government policies in place during 1983 supported all northwestern commodity systems, but especially those characterized by more advanced production technologies. Although the net subsidy accounts for 46 percent of the private output value of the traditional milk system, the net support of the large milk system is over 70 percent of private value. A less dramatic but similar subsidy benefits the field crops. Only in the wine systems does the traditional (*ramada*) technology receive a large rate of protection relative to the more modern alternatives. These results reflect in part an explicit government attempt to modernize the agricultural sector but also the tendency of more modern and larger farms to have easier access to government support programs. Table 8.4 also indicates where government subsidies are concen-

TABLE 8.4. *Policy Effects in the Northwest, 1983*[a]

System	Returns to Land and Management		Labor		Capital		Tradables		Revenues		Net Transfer	
	Private	Social	Escudos	PSE[b]	Escudos	PSE	Escudos	PSE	Escudos	PSE	Escudos	PSE
Dairy												
Traditional milk	−173.2	−466.6	−13.6	−2.1	77.4	12.2	5.0	0.8	224.6	35.4	293.4	46.3
Small milk	14.4	−237.3	−15.9	−3.7	36.0	8.4	7.0	1.6	224.6	52.2	251.7	58.5
Medium milk	105.3	−186.2	−13.5	−3.1	58.0	13.4	22.4	5.2	224.5	51.8	291.4	67.2
Large milk	94.8	−206.6	−14.6	−3.4	69.7	16.5	21.8	5.1	224.7	53.1	301.6	71.2
Field Crops												
Regional corn	−1.6	−11.4	−0.4	−1.2	4.7	14.0	0.4	1.2	5.9	17.6	10.6	31.6
Hybrid corn	1.2	−7.8	−0.7	−2.0	2.6	7.3	1.4	3.9	5.9	16.5	9.2	25.7
Traditional potato	3.2	0.9	−0.3	−1.9	0.9	5.6	0.5	3.1	1.2	7.4	2.3	14.2
Medium potato	3.1	0.4	−0.3	−1.9	2.0	12.3	0.3	1.5	1.2	7.4	3.1	19.4
Large potato	3.9	1.4	−0.3	−1.9	1.3	8.0	0.3	1.9	1.2	7.4	2.5	15.4
Wine												
Ramada-home	−5.3	−16.7	−0.1	−0.3	11.6	45.1	−0.1	−0.4	0.0	0.0	11.4	44.4
Ramada-cooperative	3.4	−8.7	−0.4	−0.5	12.5	18.2	−0.1	−0.1	0.0	0.0	12.0	17.6
Cordão-cooperative	32.5	20.1	−0.4	−0.4	13.2	14.2	−0.4	−0.4	0.0	0.0	12.4	13.3

SOURCE: PES team estimates.

[a]Escudo figures are the difference between private and social values; plus (+) equals a subsidy, and minus (−) equals a tax. Dairy figures in escudos per kilogram of edam cheese and wine figures in escudos per liter; field-crop figures in escudos per kilogram.

[b]Producer subsidy equivalent, calculated as the percentage tax or subsidy in the private value of output.

trated within the cost and return structure of each system. The following discussion focuses on each set of commodity group policies that generated these subsidies.

Social Profitability of Dairy Systems

An explicit government support program for northwestern dairy farmers has existed since 1967. After the 1974 Revolution, however, the government increased its efforts to provide the Northwest with an expanded horizon of economic opportunities, specifically through a guaranteed market and price for milk. All systems benefit from the fixed price scheme, but small farmers have enjoyed a particular advantage from the guaranteed market. Under the policies operative in 1983, the government promised to pay the local and regional cooperatives a fixed margin for every liter of milk they picked up and transported. In exchange for this right to exclusive collection, the cooperatives agreed to service all milk farmers located in the milkshed, regardless of difficulty of access. In the absence of such an arrangement it is doubtful that as many small farmers—especially in mountainous areas—would have had a market outlet.

Another aspect of the guaranteed-market policy, the collective milking parlor, brought unprecedented opportunities to small dairy farmers. The network of local parlors installed and equipped by the dairy cooperatives was financed primarily through a 40 percent government subsidy for milking equipment and bulk tanks and through a subsidy for each liter of milk obtained through the mechanized and refrigerated parlors. The average user of the collective milking parlor has about two cows, but about sixty cows are milked at any given parlor. In the more isolated areas, where dairy specialization is uncommon, milk producers are assured a guaranteed market. The cooperatives maintain pickup posts with regular schedules.

The government sets a price for raw milk that varies with butterfat content and seasonal availability (price incentives are offered to encourage production during the winter period). The cooperative receives one fixed payment for transport and another for certain liquid milk processing activities, such as pasteurization and ultra-high temperature (UHT) treatment. Liquid milk is then sold to consumers under highly subsidized prices in an attempt to assure the distribution of milk to low-income groups.

Cheese prices, however, are not subsidized directly. Instead, the government milk and meat monopoly, the Junta Nacional de Produtos Pecuários (JNPP), controls all trade in dairy products. Restrictions on imports in 1983 caused the domestic price of cheese to be 74 percent above the world price. This pricing difference accounts for over half of the total subsidy provided to these dairy systems.

The policies that affect the costs of tradable inputs to dairy producers

apply primarily to mixed feeds and fertilizers. Until June 1983, the government subsidized about 15 percent of the cost of dairy feed concentrate and about 50 percent of all fertilizer costs. These subsidies are included in the results for 1983. The medium and large milk systems were their principal beneficiaries.

Some factor policies tax the agricultural sector, and others subsidize it; the net effect of all factor transfers, however, is to enhance private profit, especially for the more modern systems. Labor laws tax employers by requiring that workers receive a thirteen-month salary and a month's paid vacation each year. Employers also are legally obligated to contribute approximately 24 percent of salaries to social security programs. Although many farmers in the Northwest use paid labor, they tend neither to pay these labor taxes nor to provide the other benefits. The analysis thus includes these taxes on labor only in private processing activities.

Policies in the capital markets affect primarily the modern farm sector. Although the traditional and small milk systems incur an estimated private real capital cost of 4 percent, the medium and large systems have access to bank credit at real interest rates of 2 percent. The social cost of capital is estimated at 8 percent per year (chapter 4). In addition, a specific dairy subsidy partially reimburses farmers and cooperatives for the costs of milking parlor equipment, including bulk tanks.

Portuguese dairy policies have been very successful in supporting both large and small farmers in the Northwest. The response to opportunities created by these policies has been remarkable in terms of regional increases in milk production. The results of private profitability analysis show that in 1983 the income of small milk systems had significantly increased over that of traditional milk systems and that larger milk systems generated attractive profits. From the farmers' perspective, dairy policies have increased farm income and stimulated investment.

Although dairy policies have raised the incomes of northwestern farmers and increased the milk supply to urban consumers, they have been costly to the Portuguese government, both in budgetary terms and in the opportunity costs of resource use. The highly negative social profitability of northwestern dairy systems suggests that under 1983 technologies and prices, Portuguese dairy producers were not competitive on the international market and did not enjoy a comparative advantage. Portugal thus spent more on producing dairy products than the products would have cost if imported. If dairy policies had not provided a substantial support structure, milk producers and processors would have felt strong pressures either to increase productivity or to abandon dairy activities.

Social Profitability of Field-Crop Systems

In 1983, it was government policy to subsidize field-crop systems. Pricing policies on outputs, tradables, and factors have resulted in net

policy transfers that range from 25 to 31 percent of private output value for corn and from 14 to 19 percent of private output value for potatoes.

Corn production in the Northwest shows a socially negative profit under both traditional and modern systems. Without a significant net policy transfer, corn producers would feel strong adjustment pressures. Output pricing policies for corn as grain account for over 55 percent of the net subsidy to corn systems, and limestone and fertilizer subsidies make up much of the remainder. The marketing of and trade in corn as grain were officially controlled in 1983 by the national grain monopoly, the Empresa Portuguesa para Abastecimento de Cereais (EPAC). Because of the Northwest's small farm structure and more difficult terrain, EPAC functions less effectively there than in the South in its role as principal marketing agent. Very little corn is purchased and stored regionally by EPAC; however, the monopoly does administer the pricing policies set by the government. In 1983, it was also the sole importer of corn and its sole supplier to the mixed feed industry. The domestic price for yellow corn exceeded the world price by 35 percent, thus providing strong commodity support for corn farmers; but the mixed feed industry received imported corn often at subsidized prices that were below world levels.

Potato production under all technologies has a positive social profitability and does not require policy support in order to be competitive. There is no fixed price for potatoes, but domestic prices in 1983 were protected through government import licensing. The JNF infrequently has purchased surplus production to shore up low potato prices. Producers benefit more directly from fertilizer and limestone subsidies, favorable credit terms, and a certified seed potato program in the Northeast region.

Government intervention in *vinho verde* production and marketing focuses on control of the quality and quantity of the wines. Most of the Northwest is within the *vinho verde* demarcated region (a government-designated area, characterized by specific soil and climatic conditions, that produces a unique wine). Government influence in the production of *vinho verde* is felt through the Comissão de Viticultura da Região dos Vinhos Verdes (CVRVV), which is part of the Ministry of Agriculture. The commission maintains a cadastral survey of vineyards and functions as both a research and lobbying group for producers. Participation is voluntary, but the commission helps set policy that affects all producers and issues the seal that distinguishes a legitimate *vinho verde*. New *vinho verde* vineyards are severely restricted in the Northwest, and the CVRVV attempts to control the quality of grapevine stock used in replantings. These efforts are aimed at delimiting and defining a product that can be recognized in both domestic and international markets.

Since *vinho verde* is a diffferentiated wine that is neither taxed nor

subsidized by output policy, the social profitability analysis assumes that private and social output prices are identical. Grape production requires little fertilizer; hence policies on tradables do not affect the system. The only divergence influencing the results is the differential cost of capital, and the wine systems have a significant amount of capital in both vineyards and processing facilities.

Projected Private and Social Profitability for Northwest Systems

Projected changes in policy will alter the 1983 base case profitability of the northwestern commodity systems. Policy changes to remove fertilizer and mixed feed subsidies occurred in June 1983. In 1986, however, farmers in the Northwest faced a shifting and different set of policies as Portugal adopted the transitional arrangements leading to full compliance with the CAP. The projected impact of EC accession on the northwestern systems is presented in Table 8.5; results are reported for the base year (1983), the first year of transition (1986), the end of the first stage of transition (1991), and the first year of full integration (1996).

Full membership in the EC will remove from Portugal control over several policy instruments. The most critical changes for the Northwest are output pricing and monopoly control over imports. Portugal's dairy prices are well above world prices and even above the protected EC prices. During transition, Portugal will gradually adopt the EC price and market structure, and producer prices will decline in real terms to harmonize with EC levels. At the same time, the Northwest could well face competition from other dairy producing regions of Europe, particularly the Netherlands and Denmark, which will have increased access to Portuguese markets.

Portugal also will lose control over policies on input pricing. Fertilizer and mixed feed subisides, already eliminated in 1983, will no longer fall within the range of possible interventions. However, Portugal will retain control over domestic factor policies and macroeconomic instruments.

The falling profitability of dairy commodities presents the most pessimistic situation for northwestern agriculture. The economic opportunities enjoyed by milk producers over the last two decades are expected to shrink dramatically under EC conditions. When the importance of milk revenue to total household income is considered, the declining profitability will be seen to exacerbate potential social problems in the region.

Under transition arrangements, cheese prices are to harmonize with those of the EC by 1991. But because of the continuing large surplus of dairy products in Europe, EC prices themselves are projected to decrease through 1996. As a result, real cheese prices will drop 35 percent

TABLE 8.5. *Private and Social Profitability for Commodity Systems in the Northwest, 1983–96*[a]

System	1983		1986		1991		1996	
	Private Profit	Social Profit	Private Profit	Social Profit	Private Profit	Social Profit	Private Profit	Social Profit
Dairy								
Traditional milk	−173.2	−466.6	−16.1	−47.2	−30.0	−35.1	−40.8	−46.2
Small milk	14.4	−237.3	−24.5	−261.4	−91.9	−111.2	−176.1	−194.0
Medium milk	105.3	−186.2	84.9	−215.4	−3.9	−44.7	−69.9	−109.4
Large milk	94.8	−207.0	71.7	−235.8	−14.9	−62.2	−79.1	−125.0
Field-crop								
Regional corn	−1.6	−11.4	−2.5	−15.0	−5.2	−8.2	−12.1	−15.0
Hybrid corn	1.2	−7.8	−0.4	−12.0	−3.1	−4.9	−9.9	−11.6
Traditional potato	3.2	0.9	2.9	1.2	2.5	2.0	2.0	1.6
Medium potato	3.1	0.4	2.9	0.4	2.6	1.3	2.3	0.9
Large potato	3.9	1.4	3.8	1.7	3.5	2.7	3.2	2.4
Wine								
Ramada-home	−5.3	−16.7	−6.0	−17.0	−5.4	−16.4	−5.3	−16.3
Ramada-cooperative	3.4	−8.7	4.5	−7.1	3.5	−8.1	2.6	−9.2
Cordão-cooperative	32.5	20.1	32.9	21.4	32.3	20.1	31.6	20.2

SOURCE: PES team estimates.

[a]Dairy system measured in escudos per kilogram of edam cheese, field-crop system in escudos per kilogram of corn and of potatoes, and wine in escudos per liter.

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between 1986 and 1996. On the cost side, all subsidies on tradable inputs will be removed; however, declining EC prices for corn will reduce somewhat the cost of mixed feeds. The more modern systems will benefit from this decrease. Labor costs, however, are projected to increase by 1.8 percent a year, reflecting an assumed steady growth in the Portuguese economy. The net effect of these changes will be a reduction in private profit for all dairy systems. Subsidies will gradually decline through the transition period because of the loss of Portuguese flexibility in determining commodity policy. All dairy systems will become unprofitable in private terms, although the pre-accession profitability ranking will remain unchanged.

Portuguese dairy policy has met with impressive success in increasing small farm incomes in the Northwest. These projections, however, suggest a sharp decline in the remuneration of family labor through 1996. The traditional milk system will become unfeasible under EC policies, and the transfer of these farm resources to other systems will accelerate. The small milk system, however, faces a land constraint that limits technological change. Total costs would have to drop 40 percent or milk yields would have to increase 66 percent for a breakeven level to be reached.

Primarily because medium and large milk systems are less affected by increasing labor costs, their private profits will decline less rapidly than will those of the other systems. Although these systems also will face pressures to change, technological improvements that would increase milk yields by approximately 25 to 30 percent in 1996 would allow farmers to reach a breakeven point. But these larger farmers represent less than 5 percent of all dairy producers in the region.

Corn producers in the Northwest also face declining profits, but they have greater opportunity for improvement. The unprofitability that will appear after 1986 will result from Portugal's harmonization with decreasing output price levels in the grain-surplus EC. Both the traditional and the small corn systems employ large amounts of labor, and the projected increase in real labor costs affects profits significantly. Nonetheless, long-term increases of 25 to 30 percent in corn yields would allow these systems to remain privately profitable. Carvalho (1985) argues that improvements in regional corn seed varieties could achieve necessary yield increments without large differences in fertilizer use. He further suggests that investments in traditional local irrigation systems could bring increases in corn productivity. Such improvements would also reduce the costs of the small milk system.

All three potato systems will remain profitable throughout the projected period. Private and social profit levels will drop slightly because of changes in labor costs; however, entry into the EC will have little direct impact on potato producers. Any decisions regarding the subsidization of

a domestic seed potato program might affect northwestern producers indirectly. But Portugal should retain its comparative advantage in potato production. If export possibilities can provide farmers with a more stable potato price, more resources might flow from corn and milk production into potatoes.

The two high-quality wine systems will maintain positive private profits that will drop slightly through 1996 because of increasing labor costs. The impact of EC accession will be minimal because CAP intervention policies do not affect the high-quality white *vinho verde*. However, the indirect benefit of enhanced access to European markets will most likely improve the international acceptance and competitiveness of this wine.

The home-processed red *vinho verde* will be both privately and socially unprofitable throughout the projected period. The analysis assumes that red *vinho verde* will qualify for CAP intervention pricing after accession, which will result in an increase in output value after 1991, the beginning of the second stage of transition. In view of the large surplus of wine in the EC, however, real output prices are assumed to decline through 1996. As with the other labor-intensive systems, increases in labor costs for red *vinho verde* production will contribute to growing losses. These results, when compared to those for the other wine systems, suggest that the traditional red *vinho verde* gradually will become a subsistence item for the Northwest region, with declining production for the regional market.

Conclusions

With the exception of potatoes and high-quality wine, the commodity systems of the Northwest will fare poorly under the policy changes associated with entry into the EC. The traditional corn, dairy, and wine production systems are highly labor-intensive, and labor is paid at a below-market rate. The systems are ill-prepared to enter competitive markets and in the absence of change will slowly disappear or stagnate as basic subsistence activities.

The more modern systems were all privately profitable in 1983, but only the wine and potato systems will remain so in 1996. The more advanced milk systems and the small corn systems will lose the high levels of Portuguese price protection after EC accession, and profits will fall. Therefore, the future incomes of both traditional and modern northwestern farmers are expected to fall.

The results of the profitability analysis indicate where pressures for change will be greatest. The magnitude of the problem is suggested by the fact that traditional and small farmers account for 98 percent of all producers in the Northwest, and these farmers are projected to experience the severist income drops and feel the most intense pressure for

change. Particularly for the small dairy producers, the income increases of the recent past will be reversed by entry into the EC and the loss of Portuguese protection.

These pressures will tend to push resources out of certain activities and to stimulate technological change in others. In both cases, northwestern farmers face limited choices. Although the analysis would predict a flow of resources into potato or wine production, both of these systems face constraints on their expansion. Disease risks and widely fluctuating prices are problems that limit increases in potato production. The expansion of *vinho verde* grapes is prohibited under current policy, but the gradual substitution of red for white grapes and a reduction in the home processing of wine will most likely accelerate.

Improvements in technology are related to both investment and structural change. The transformation of small milk systems into the more favorable medium milk systems is constrained by land structure in the Northwest. Serious consideration ought to be given to changing current land policies and to finding imaginative solutions to the problem of increasing farm size. The medium and large milk systems and the small corn system would benefit greatly by improvements in yields. These changes could occur through investments in research and extension.

The prognosis for Northwest commodities and for farm families in the region argues strongly for a concerted effort to improve yields, facilitate structural changes, and seek new alternatives both within and outside agriculture. Change in the region is inevitable under the projected conditions.

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PART THREE

Agricultural Change in the Northwest

9. Technical Change in a Northwest Parish

by Jeffery W. Bentley

The previous chapter indicated that substantial pressures for adjustment in the Northwest will occur as a result of EC membership. Reaction to these pressures will involve major structural and technical changes in Northwest agriculture. Changes in landownership and land use, shifts in labor use, and technological change will interact, albeit gradually, to create a new agricultural structure for the Northwest. This chapter and the two following ones describe and analyze past and probable future changes in technology and the structure of agriculture in the Northwest. The impacts of policy are highlighted and analyzed throughout.

The basic unit of analysis shifts from the commodity system to the whole farm. This shift is necessary since technical and structural changes are best understood within the context of the basic decision-making unit—the whole farm. This chapter describes the principal technical and structural changes that have occurred in one northwestern parish in the Entre Douro e Minho region. Attention is given to the macroeconomic and policy environment as well as to the microeconomic and social factors influencing the observed changes. Lessons from this parish study are complemented by results from a survey of five other parishes to form the background for the broader, regional analysis in the following two chapters.

Background and Definitions

The parish occupies about 10 square kilometers of hilly woods and cropland on the eastern edge of a plateau above the Cavado River Valley. Most of the land lies between 300 and 400 meters above sea level. The parish is 15 kilometers from a regional city of 70,000 inhabitants. In 1984, the population of the parish was 1,160 people, living in 261 households.

The main commodities produced in the parish are dairy products, corn, wine, rye, forages, and potatoes. Olive and fruit trees, beans, and vegetables are also grown. In addition to Frisian dairy cows, a number of other animals are raised: a local variety of work cow, horses, sheep, goats, chickens, pigs, and rabbits. The dominant forest plants are Scotch pine, eucalyptus, oak, chestnut, gorse, ivy, blackberry, broom, heather, and

ferns. The trees are used for lumber and firewood. The brush plants (gorse, broom, heather, ferns, and others) are used for stall bedding.

Rainfall, of about 2,000 millimeters per year, occurs mainly in the winter. Precipitation varies little from year to year (Stanislawski 1959, 39). Water for summer crops is supplied through irrigation from springs, wells, and a stream.

Dividing the 261 households into farm and nonfarm units is difficult and arbitrary. If a farm is defined as an enterprise using cultivated cropland, there were 160 farms in the parish in 1984. Many of these farms are very small, however, controlling less than a half hectare of cropland. They represent part-time employment for households in which some members work full time off the farm or are retired. Of the remaining 101 households, 11 have forestland but no cropland and the other 90 own neither cropland nor forestland.

Because of the importance of dairying in stimulating technical change and increasing incomes, the 160 farms are subdivided into those with and those without cows. The distribution and characteristics of 152 of these farms are given in Table 9.1; 8 farms with cows were omitted because of incomplete data. Much of the discussion in this chapter focuses on the farms with at least one dairy or work cow, called dairy farms. The addition of a cow to a household's livestock inventory is an important change. Milk and calves are the most important farm produce marketed, and one cow requires six to eight hours of labor daily, thus representing the equivalent of one full-time household member committed to agriculture.

The data in Table 9.1 indicate the small size and fragmented nature of the farms in the parish. In 1984, the average dairy farm had 6.2 hectares of forestland and cropland, divided into 13.3 parcels. Since 71 percent of this land was forest and brush, the average amount of cropland was only 1.9 hectares, divided into an average of 5.7 parcels. Mean parcel size was 3,300 square meters. The 22 dairy farms with five or more cows owned most of the milk cows (66 percent), operated about one-half of the parish cropland, and owned over one-half of the tractors. These larger farms also had the highest number of parcels per farm, indicating that fragmentation is more characteristic of larger farms than of small farms. Dairy farms with one or two cows represented 45 percent of the dairy farms but controlled a small proportion of the cows, land, and tractors.

The small farms and fields demand a great deal of labor, especially hand labor. The sight of people weeding corn fields with hoes and transporting corn stalks on oxcarts gives the impression that agricultural technology has changed little since the Middle Ages. A year of field research provided much evidence that agricultural technology in fact has changed a great deal in the parish and the region.

TABLE 9.1. *Distribution and Characteristics of the Farms in a Northwestern Parish by Number of Cows, 1984*

Number of Cows	Number of Farms	Milk Cows		Work Cows		Cropland		Parcels		Tractors	
		Number	Average per Farm	Number	Average per Farm	Hectares	Hectares per Farm	Number	Average per Farm	Number	Average per Farm
0	79	0	0.0	0	0.0	15.89	0.20	122	1.54	2[a]	0.03
1	20	17	0.85	3	0.15	14.43	0.72	72	3.60	0	0.0
2	13	24	1.85	2	0.15	13.17	1.01	58	4.46	2	0.15
3	9	20	2.22	7	0.78	13.76	1.53	36	4.00	3	0.33
4	9	34	3.78	2	0.22	22.72	2.52	56	6.22	8	0.89
5–9	18	96	5.33	17	0.94	52.26	2.90	144	8.00	12	0.67
10–33	4	87	21.75	0	0.0	24.48	6.12	48	12.00	6	1.50
Total—all farms	152	278	1.83	31	0.20	156.71	1.03	536	3.53	33	0.22
Total—dairy farms[b]	73	278	3.81	31	0.42	140.82	1.93	414	5.67	31	0.42

SOURCE: Author's data plus information from the 1983 land survey conducted by the Repartição das Finanças.
[a]One nonfarmer with no land owns a tractor.
[b]Farms with one or more cows; eight farms with cows were omitted because of incomplete data.

Historical Changes in Agricultural Technology

The agricultural technology of the parish rarely has been stagnant. Over the centuries, corn, beans, potatoes, and other American crops have been widely adopted. After the phylloxera epidemic of the 1860s, American grape root stocks resistant to the disease were introduced. Copper sulfate spraying (the Bordeaux mix) was introduced in the late nineteenth century to combat grape vine mildew. Large stone corn cribs were adopted in the late nineteenth century, half a century after corn became a staple, to aid in the drying and storing of corn.

Since the 1940s, agricultural changes have been more dramatic. In three major episodes of change, farmers adopted a number of labor- and land-saving innovations. Figure 9.1 shows a chronology of emigration and the corresponding local changes in agricultural technology. Estimates of the amount of net out-migration and population changes in the parish from 1920 to 1980 are given in Table 9.2. Implied net out-migration

1940	1950	1960	1970	1975	1980	1984
End of Brazilian emigration		Emigration to France begins		Emigration to France declines		
Labor-Saving Devices						
Corn shellers		Rye threshers			Silage	
Grain cleaners		Tractors			Hay balers	
Water pumps		Tractor-driver corn shellers			Manure spreaders	
		Fertilizer as replacement for brush				
		Flax abandonment				
		Grape crushers				
Land-Saving Devices						
	Some use of chemical fertilizer and hybrid corn seed				Limestone	
Increase in grape *ramadas*		Increase in fertilizer use		Commercial dairying		
		Hybrid corn use on some farms		Modern potato production		
				Increase in hybrid corn use		

FIGURE 9.1. *Chronology of Technological Change and Emigration Experience, 1940–84*

TABLE 9.2. *Changes in Population and Implied Net Out-Migration of a Northwestern Parish, by Decade, 1920–80*

Year	Resident Population	Births by Decade	Deaths by Decade	Implied Net Out-migration by Decade[a]
1920	755			
		278	158	8 (1920–30)
1930	867			
		318	144	69 (1930–40)
1940	972			
		333	165	42 (1940–50)
1950	1,098			
		367	176	103 (1950–60)
1960	1,186			
		375	135	402 (1960–70)
1970	1,024			
		326	124	116 (1970–80)
1980	1,110			

SOURCES: Instituto Nacional de Estatística (INE), *Recenseamento geral da populaçao*, various years; and local parish records on births and deaths.

[a]Implied net out-migration equals the difference between the natural rate of population growth (births minus deaths) and the change in resident population. For example, between 1920 and 1930, the natural rate of population growth was 120 and resident population increased by 112; thus, the implied net out-migration was 8.

peaked in the decade 1960–70, when resident population declined. Emigration has been a major factor in social change and agricultural development in the parish and the region.

The 1930s through the 1950s

The first major episode of change was a series of labor-saving innovations that followed significant emigration from the parish to Brazil in the decade 1930–40. Estimated net out-migration in that decade was 69 people (Table 9.2), almost a tenth of the total population. Guerreiro (1981, 149–154) describes a similar emigration to Brazil from a nearby community.

Low wages and land scarcity were important factors in stimulating out-migration. In the 1930s, female farm workers earned Esc 1.5 per day; male farm workers earned Esc 2. Yet a *rasa* of corn (about 13 kilograms, or about enough for a week's bread) cost Esc 8. During the five to seven month off-season, large numbers of rural poor walked from farmhouse to farmhouse, begging for pieces of bread. Guerreiro states that, during this time, the rural people were so hungry they offered their labor in exchange for a day's bread and water and there were women who prostituted themselves for a kilo of sugar (1981, 196). Although the total parish population increased during the 1930s, the prime labor force probably declined, as young adults emigrated to escape low wages and land scarcity.

By the 1940s, farmers were responding to this loss of labor and the consequent increase in the cost of labor by adopting corn shellers powered by diesel motors and drawn on oxcarts. When tractors were introduced, farmers began using corn shellers attached to the tractors' power

takeoff. Corn shellers save labor; they can shell about 50 kilos of corn per minute, compared to the 30 kilos per hour that a person can shell with a threshing flail. The adoption of corn shellers was early and relatively complete. Larger dairy farmers (those with five or more cows) adopted corn shellers in the 1940s, much earlier than did smaller farmers in the parish. All of the 81 dairy farms in the parish currently use tractor-powered corn shellers.

Another innovation of the 1940s was the water pump, also diesel-powered and moved about on oxcarts. The first pump was rented out by the hour to local farmers to lift water out of wells. It was a labor-saving device, replacing the power of the oxen that used to turn the wheel-driven bucket-and-chain devices for lifting water from the shallow wells. The pumps eliminated one worker from the irrigation process, the person who drove the draft animal. The pumps also lifted water faster than the wheels, increasing the productivity of the person doing the irrigation. Motor pumps have long since replaced cattle for lifting water from wells, and there no longer are any pumps for hire, since most farmers have their own water pumps.

Yet another 1940s innovation was a wooden hand-cranked grain cleaner with a series of metal screens, which replaced an earlier Portuguese implement, a type of winnower with no moving parts. The grain cleaner was so inexpensive that all farmers could purchase one or make one themselves. The grain cleaner is now a standard feature on most farms in the area.

Little technological change occurred in the 1950s. Chemical fertilizers and hybrid corn seed were introduced, although they were not used in quantity until the 1970s. In the 1950s, most farmers used very small amounts of fertilizer and only 4 or 5 experimented with hyl rid corn seed. Trellises made of granite posts and steel spanners existed before the 1940s. They are used to support grape arbors (*ramadas*) 4 meters wide and 3 meters tall around field edges. Their construction increased in the 1940s and 1950s as remittances from the people who had emigrated began to enter the community.

The 1960s

The second major episode of technological change also involved a series of labor-saving innovations. In the early 1960s, a large number of people from the parish, especially young men, emigrated to France. Although many of these men were farmers, an even larger proportion were the sons of sharecroppers and landless laborers.

An interesting measure of labor mobility is the number of households that currently have or previously have had a family member living abroad. From the 261 resident households, 164 people (from 138 house-

holds) were emigrants in 1984 or had been emigrants and had returned to the parish; of this number, 136 were men and 28 were women. The men were absent for an average of 11.6 years, compared to 8.7 for the women. All the women who emigrated joined husbands already living abroad. Emigration was heaviest in the 1960s. By the mid-1970s, France essentially had closed its borders to new male workers, allowing only familial immigration of wives and children joining men already in France (Brettell 1979, 16).

From the 1960s to the 1980s, the amount of labor available for agriculture continued to decrease. Many people took local off-farm jobs. Much of this employment was in the construction trade, frequently in the construction of houses for returning emigrants. There were at least 71 new houses started between 1960 and 1980 (author's census of the parish, 1984), and many existing houses were completely rebuilt.

The immediate result of the decline in the availability of cheap labor in the 1960s was that farmers began using tractors. The number of farmers using tractors expanded significantly during the 1970s, increasing from 33 at the beginning of the decade to 73 by the end of it. All 81 dairy farms in the parish were using tractors in 1984, at least for some tasks. This change was dramatic, since the first tractor had appeared in the parish in about 1960. Tractors were adopted first by the larger farmers because they faced greater labor constraints, could use the tractors more efficiently, and had easier access to capital than the smaller farmers.

Although only 27 dairy farmers (and 3 nondairy farmers) owned tractors in 1984 (thirty-four tractors), the use of tractors has been facilitated by a well-developed rental market for machinery. In 1984, six tractors with drivers were available for hire at about Esc 1,000 an hour for most tasks. Plowing, corn shelling, and some heavy transportation were the most common services provided by tractors.

The average tractor-owning dairy farmer controlled 3 hectares of cropland in 1984; the average non-tractor-owning dairy farmer controlled 1.2 hectares. Although tractor-owning farmers have more land than nonowners, both groups have purchased similar amounts of land. The average amount of land purchased by dairy farmers with tractors, among those who had purchased land in their lifetimes, was only 15 percent greater than for the farmers who purchased land but did not own tractors. Given a well-functioning rental market, this figure suggests that both groups recognized the labor-saving potential of tractors.

During the 1960s, the rye thresher and the tractor-driven corn sheller were also adopted. The tedious tasks of cultivating flax and processing it into linen were phased out. Flax cultivation was abandoned not only because cheap substitutes for linen became easily available but because household income was increasing to the point that farmers could enjoy

some leisure time by mechanizing some activities and eliminating others. The labor-intensive tasks with the lowest productivity, such as collecting wild acorns for pig feed, were dropped.

The 1970s and 1980s

A third major episode of technological change in agriculture occurred as a result of government programs beginning in the late 1970s and continuing to the present. In this period, the government introduced electricity and cooperative milking parlors for collecting milk.

Of the 81 dairy farms, 72 acquired improved dairy animals during this period. In 1977, 36 farmers had improved dairy cows, but these cows were kept primarily for production of milk for home consumption. Three cooperative milking parlors were built in 1978 and another in 1981. By 1979, 27 additional farmers had acquired improved dairy animals. The acquisition of dairy cows by the larger farmers (those having five or more cows) was even more rapid; nearly all had purchased dairy cows within two years after the introduction of the milking parlors.

As described in chapter 8, the cooperative milking parlors were joint ventures involving the local milk producers' cooperative and individual farmers. Four farmers in the parish supply the buildings, usually newly constructed and on their own land, which they rent to the cooperative. The cooperative provides the milking machines and refrigerated bulk tanks at no charge. The cooperative also hires a person (usually the farmer's wife or daughter) to operate the milking parlor.

Each of the four milking parlors has four stalls equipped with electric milking machines, and each has a bulk tank. Milking parlors are open twice a day. A member of each farm household (usually a woman or a child) brings the cows to the milking parlor to be milked. The operator of the milking parlor records the liters of milk produced by each herd at each milking. Milk is collected at three to four day intervals in trucks from the cooperative. Every two weeks the farmer who owns the milking parlor goes to the cooperative and collects the milk receipts in cash. The person who brings the cows to be milked then collects the money from the owner of the milking parlor.

Milk producers have to join the cooperative to be allowed to use the milking parlor. Extension agents from the cooperative have worked closely with a few farmers in the parish to establish milking parlors. Most farmers were not formally contacted by extension agents. They simply observed their neighbors' arrangements, discussed dairying among themselves, and made their own decisions to acquire milk cows and join the cooperative.

After the government provided the parish with electricity, in the late 1970s, most households began using electric corn mills to grind corn for

cooking and for animal feed. Most parishioners mill their grains at one of four taverns rather than buying their own mills. In 1984, the taverns, which function as small grocery stores, ground corn for customers at Esc 3.5 per kilo (the market price for corn was about Esc 33 per kilo), or for one-seventh of the flour. One miller still grinds corn in an old, water-powered mill. This miller carries corn flour on horseback to villagers, trading it for corn grain.

During the late 1970s, farmers expanded their use of land-saving innovations such as chemical fertilizer and hybrid corn seed. The acquisition of these and other inputs has been relatively easy because of a well-developed input market. Inputs can be purchased in the city at the cooperative or at one of several private agricultural supply stores. Some people bring inputs from town to sell in the countryside. Almost everyone had experimented with fertilizer by the 1950s, but only in small amounts. Farmers started applying fertilizer in substantial quantities only after 1970.

The increased use of chemical fertilizer seems to have reduced the demand for manure. Clearing the forest floor of brush for stall bedding and green manure (applied directly to the fields) was much more common before the period of emigration to France (Caldas 1981, 204). Brush used to be bought standing in the forest, and workers were hired to cut it. Now landowners who wish to clear out their forest floor (to avoid forest fire hazards) often cannot give the brush away. Because chemical fertilizer replaced labor-intensive brush cutting in the Entre Douro e Minho, the adoption of chemical fertilizer represents a labor-saving as well as a land-saving innovation.

Similarly, although hybrid corn was adopted by some as early as 1955, only 4 farmers in the parish had tried hybrid corn seed prior to 1974. By 1984, 45 of the 81 dairy farmers had not yet planted hybrid corn seed, which is grown primarily for silage. Farmers have been slower to adopt hybrid corn seed than other innovations. They report that raising hybrid corn is not much more profitable than producing regional corn, because hybrid corn requires much greater cash expenditures for seed and fertilizer (see Table 8.2 for details on representative hybrid and regional corn systems).

In the early 1980s, farmers continued responding to incentives in the dairy market by building silos and making silage. By 1984, 8 farmers had adopted silage, and 7 of them were larger farmers (with five or more milk cows). As described in chapter 8, the production of corn silage is a land-intensification strategy (as well as a substitution of capital for labor), since it allows corn stalks and cobs to be converted into animal feed, thus creating more feed per hectare. When corn is processed into grain, cattle will not eat the cobs and stalks. The cobs are used as fire fuel, and the

stalks are composted in the stall bedding and used as organic fertilizer the following spring.

Manure spreaders and hay balers also were adopted on a few of the larger farms in the 1980s. The use of these machines represents the further substitution of capital for labor.

Limestone adoption in the parish began in 1974. Ground limestone powder is a land-augmenting input that lowers soil acidity, allowing greater yields of hybrid corn and other forage crops. Although the traditional strains of regional corn yield only about three-fourths as much as hybrid corn, they grow well in the native, acidic soil, with less chemical fertilizer and without limestone. Thirteen of the 18 dairy farmers who had tried limestone by 1984 (an increase from 5 in 1980) were larger farmers. The farms that experimented with limestone operated a total of 37 percent of the cropland controlled by farmers. The fact that limestone has been more widely accepted by larger farmers suggests that there may be cash-flow constraints and risk considerations associated with the modern corn technology of hybrid seed, fertilizer, and limestone.

An alternative explanation for the observed pattern of limestone adoption is that limestone is following the path of previous innovations. It is now in the initial stage of being tried by larger farmers. They learned limestone technology from extension agents and are gradually passing it on to smaller farmers. Smaller farmers will seek limestone technology from larger farmers once the larger farmers have proved limestone's value and if the limestone is profitable for smaller farmers. If this adoption process follows the pattern of previous innovations, it could take ten to twenty years.

Another recent, but less important, change has been the adoption of a modern potato technology. In response to higher prices for potatoes in the mid-1970s, farmers began using improved seed potatoes and more fertilizer and began planting potatoes in larger, open stands. The older technology had been to intercrop local seed potatoes with garden vegetables in small plots, especially in the shade, using a hoe for planting and using little or no chemical fertilizer. The new potato technology, for fields larger than 1,000 to 2,000 square meters of land, uses a potato digger, a locally made modified ox plow that can be pulled by cattle or a tractor. The first potato digger was used in the parish in 1970; since then, 24 farmers have adopted it. The potato systems described and analyzed in chapter 8 include the technical and structural variations discussed here.

Sources of Change

Agricultural technology in the parish has changed because of private sector initiatives as well as government action. The introduction of milking parlors was encouraged by government policy (Carvalho, Barros, and

Rocha 1982, 100–119). The first farmer in the parish to adopt the modern potato package traveled to the Trás os Montes to learn the technology from other farmers. New machines and inputs were made available from private machine dealers, agricultural supply stores, and the milk cooperative (which carries inputs for potatoes, wine, corn, and rye, in addition to dairy inputs).

Extension agents are located in a nearby city. Although several government agencies and the local milk cooperatives sponsor these agents, all of them tend to be located in the same building. The agents travel to the countryside for consultation with farmers, although the large areas they have to cover do not permit them to meet more than a small proportion of the farmers in their areas. Larger, more aggressive farmers make trips to the city to consult with the agents. The Ministry of Agriculture also sponsors an annual farm machinery fair in the same city, where farmers can see and buy new machines.

Change is introduced by extension agents or merchants, but either the technical person or the farmer can initiate the interaction. In this community, the first farm to adopt nearly all the technical changes was a single large household. Typically, after an innovation is adopted by this large farm household, it then is adopted by other large farmers and finally is adopted by small farmers. This method of technological diffusion reflects the close communication links among all sectors of this densely populated rural community. When a farmer brings home a new machine or a new input, it is soon observed by all the neighbors. The adoption of new technology represents little technical risk for late adopters, since they may have observed a neighbor using the item for several years before adopting it themselves. However, market risks continue to exist for both large and small farmers.

The Dynamics of Land, Labor, and Capital Use

Figure 9.2 is a flowchart that typifies the complex relationships between changes in relative factor (land, labor, and capital) supplies and technological change. Emigration resulting from extreme poverty in the 1950s and new job opportunities in western Europe, especially France, led to a decreased supply of farm labor and an increased supply of funds from emigrant remittances. The use of emigrant savings to build large rural homes stimulated a demand for local construction workers.

By the mid-1970s, fewer young men could emigrate because of the recession in Europe and elsewhere, but they could find some nonagricultural employment locally. The availability of local and regional off-farm jobs also decreased the supply of agricultural labor and provided potential funds for those farm families who sent some members to work

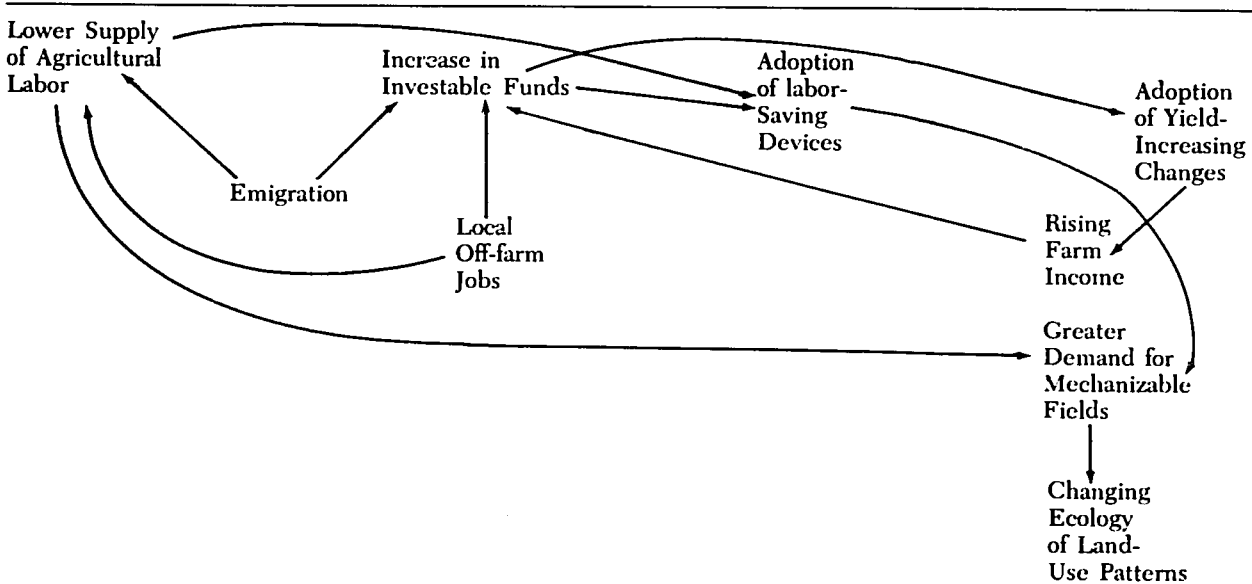

FIGURE 9.2. *Interactions between Changes in Technology and Factor Use in a Northwestern Parish*

off-farm while others managed the farm. The increases in funds in the mid-1970s, resulting from milk sales as well as from off-farm work and emigration, facilitated the use of chemical and biological inputs such as fertilizer and insecticides. As farm productivity increased, additional investments were possible.

Beginning in the 1960s, but especially during the 1970s and 1980s, rising labor costs, coupled with the increased supply of funds, enhanced the demand for labor-saving technologies, especially machinery. Associated with these changes was an increase in the demand for mechanizable fields, especially large fields located near the villages. The move into mechanized agriculture meant that, after the mid-1960s, there was less demand for fields that were too small to be plowed with a tractor, especially if they were far from the villages. Changing technology, which included the introduction of heavy earth-moving machinery, also facilitated the clearing of forestland for agriculture.

Land

The greatest constraint on local agriculture is the availability of farmland. Not only is the supply of good cropland small, it is also unevenly distributed, expensive (Esc 100 to 150 per square meter, or $US 2,700 to $US 4,000 per acre, in 1984), and often difficult to purchase or rent. The most common way to acquire large fields and large farms is through inheritance.

Inheritance. Inheritance patterns tend to maintain an unequal distribution of land. Large farms generally are not sold at the death of the owners. They are distributed unequally through inheritance to a group of heirs, usually the children of the owners. Distribution is unequal because of the local practice known as "the one-third." The heirs inherit two-thirds of the estate in equal shares. The remaining one-third may be inherited entirely by one heir. In practice, where there are a number of siblings, one inherits the one-third, as well as an equal share of the two-thirds of the rest of the estate (Dias 1981, O'Neill 1983, Silva 1983).

A complementary practice is "marrying into the house"—residing in the parents' home after marriage. Of the children of the larger farm households, only one typically marries into the house. The son or daughter who does so brings the spouse to live there, and together they care for the elderly parents until their death. There is no preference for either sex or for the oldest or youngest child. After marriage but before the death of the parents, the future heir who has married into the house uses all of the land and capital of the farm as though it were his or hers. The child who has married into the house inherits the largest share of the farm (an equal share plus the one-third) and already has had control of the farm for a

number of years; therefore, that person occasionally is able to pay off the other siblings in cash upon the death of the parents. In this case, a special, restricted type of land sale occurs.

Sometimes, one of the other siblings never marries and thus remains in the house with the sibling who has inherited the one-third. The unmarried sibling works on the farm and shares in the consumption of household income while retaining individual title to the original portion of land, even though all of the household land is worked in common by household members. The practices of inheriting one-third, marrying into the house, and paying off the co-heirs allow many large farms to remain intact for generations. Inheritance practices therefore normally do not lead to increased land fragmentation or decreased farm size.

For 71 dairy farms in the parish, total land-area and land-acquisition histories were known for the lifetime of the family members, as of 1984 (Table 9.3). Data on these farms were divided into two categories: small-farm (one to four cows) and large-farm (five to thirty-three cows). The 71 farms occupied a total of 138 hectares of cropland, 65 percent of the land was acquired through inheritance or inheritance plus payment to co-heirs, 20 percent was obtained through purchase, and 15 percent was rented. The average size of farms acquired solely through inheritance (2.4 hectares) is larger than the average size of farms acquired only through purchase or rent (1 and 1.2 hectares, respectively). Small and large dairy farmers acquired more land through inheritance than through any other source (Table 9.3).

TABLE 9.3. *Land-Acquisition Patterns for Small and Large Dairy Farm Households in a Northwestern Parish as of 1984*[a]

Item	Small Farm Households (1 to 4 Cows)	Large Farm Households (5 to 33 Cows)
Total cropland area (in hectares)	64.11	73.84
Number of farms	51	20
Number of farm households that inherited land	31(61 percent)	18(90 percent)
Number of farm households that purchased land	32(63 percent)	8(40 percent)
Number of farm households that rent land	25(49 percent)	6(30 percent)
Average inheritance (in hectares)	0.60	3.00
Average purchase (in hectares)	0.37	0.41
Average rental (in hectares)	0.29	0.27
Percent of land inherited	48	81
Percent of land purchased	29	11
Percent of land rented	23	7

SOURCES: Author's data plus information from the 1983 land survey conducted by the Repartição das Finanças.
[a]The sums of the three percentages in parentheses in each column are greater than 100 percent because some farm households acquire land through a mix of inheritance, purchase, and rent. The total land area and the total number of dairy farms are different than in Table 9.1 because of incomplete data on two of the small farms.

Rental Arrangements. Nondairy farmers as well as dairy farmers rent land. A nondairy-farm household may rent a field to grow garden vegetables, potatoes, and sometimes corn; 70 of the 261 resident households (not counting sharecroppers) rented or borrowed agricultural land in 1984. This figure does not include a large number of agreements in which people cared for an emigrant's yard in exchange for the garden produce from it. For 67 documented rental cases where land size was known, average field size was 2,830 square meters; average field size on dairy farms in the parish (432 fields) was 18 percent larger, or 3,340 square meters. Fields are rented from large farm households, retired people, emigrants, other people who have inherited land in the parish but have moved away, and, in a few cases, people who have inherited land in the parish but have never lived there.

There are 127 people who own land (fields and forests) in the parish but do not live there; 52 of them own fields. The 127 absentee landowners constitute 48 percent of the total number of landowners (266), yet they own only 15 percent of the cropland. This situation occurs because it is more convenient for an absentee owner to have forestland than cropland. Forests are not so intensively managed and do not have to be rented out if the owner is away.

Borrowed land is nearly always the result of a transaction between close kin. Some emigrants loan land to their parents or other family members. The elderly commonly loan land to their next of kin in exchange for old-age care.

As indicated by the information presented here, the rental market in the parish has been quite active. Over 40 percent of the dairy farmers rented land in 1984 (Table 9.3). Land rental has been an important source of land for the small dairy farmers and has allowed some of them to expand their operations; the large dairy farmers rent land much less frequently (Table 9.3).

Sharecropping, an old form of land rental, has changed dramatically since the early 1960s. At that time there were about 20 sharecropping households in the parish. In 1984, there were only 6. The sharecroppers' rent is collected in kind after harvest—one-half of the corn, rye, and bean crops as well as a portion (usually one-third) of the wine. The landowner allows the tenants to keep some of their own cows and pays for all of the wine inputs and half of the other inputs. As Caldas (1981, 212) notes for the Entre Douro e Minho region, the frequency of sharecropping declined as fewer people were willing to pay the normal share and as the old patron-client relations dissolved. When off-farm job opportunities were created, sharecroppers' sons emigrated or took blue-collar jobs rather than farm for minimal returns.

At the same time, the adoption of machinery allowed large farmers to

farm all of their own land without sharecroppers. The pre-1960s pattern was for a farmer to farm about 2 hectares of his own land and to rent the rest to sharecroppers. A few landowners rented all of their land to sharecroppers. The adoption of tractors and other machinery has allowed farm households to work as many as 6 hectares using little hired labor.

Purchase. Another adjustment to the land constraint is land purchase. In the 1984 household census of the community, 129 of the 261 resident households had purchased land after the households were established. Although many of these purchases were of plots for homesites, some were for agricultural purposes. Each homesite tends to be small, 2,000 square meters or less, and most of it is devoted to carefully tended kitchen gardens. Houses are built in fields or on forestland that is cleared for the house site and garden area.

Eleven households purchased whole farms. Some whole farms (made up of several noncontiguous plots) that were put up for sale after the 1960s were divided into 2 or 3 small farms and purchased as semiretirement farms by returning emigrants. Where the whole farm was purchased by the present farm couple, the size was generally small (the average being 1 hectare and the largest 2.2 hectares). The 40 dairy farm households that purchased land in their lifetime bought an average of 6,740 square meters. The largest purchase of farmland, including a number of plots purchased over a period of years, was 3 hectares. This farm was purchased in the 1950s with money from rural industry. Land purchase was the second most important source of land for the small and large dairy farms (Table 9.3).

The Changing Ecology of Land Use. Another important development has been the changing ecology of land use. Over the past sixty years, a number of fields have been allowed to revert to natural forest or have been planted in timber. Land reforestation has increased since emigration to France began in the early 1960s. The reforested fields have been either far from the villages and main roads, too small to be plowed with a tractor, or without irrigation water.

During the same sixty-year period, other forest plots have been converted into cropland. In the past, the process of clearing and leveling forest plots with animal power and hand tools was labor-intensive. By the 1980s, farmers were renting heavy machinery to make this task easier. The new technologies of mechanized well-digging, irrigation pumps, heavy earth-moving machinery, and chemical fertilizers made it possible for farmers to clear, and render productive, forest parcels of 0.5 hectare to 5 hectares. Although only about 10 hectares were cleared and leveled between 1980 and 1984, the process of forest clearing is potentially the

most significant means of farm expansion for the near future. Many farmers own potential field sites, and the profit from selling the timber from the land nearly equals the costs of leveling, digging a well, and building an irrigation tank. Furthermore, much of the forestland has the advantage of being close to existing fields.

Labor

As indicated earlier, the agricultural labor supply in the parish diminished after the 1960s, as people emigrated or took newly created, local off-farm jobs. The total labor force in 1984 was about equally divided between on- and off-farm workers, but less than a third of the men were working in agriculture. Older residents report that almost no one worked off-farm a generation ago. In 1984, construction workers earned from Esc 1,000 to Esc 1,500 for an eight-hour day; at the same time, male farm workers earned about Esc 400 plus meals and often worked from sunup to sundown. Since off-farm work has been available on a more permanent, dependable basis, twelve months a year instead of six or seven, most men prefer to work at nonfarm jobs rather than as farm laborers. Nearly all men who worked on dairy farms in 1984 were independent owner-operators, not wage earners, and therefore they were fully occupied throughout the year.

In contrast to men, women work in agriculture in spite of the low wages because they have not had good off-farm employment possibilities. In 1984, women in the parish earned each day only Esc 200 to Esc 250 plus meals for farm work; yet three-fourths of the female labor force was involved in agriculture. Some of the women who worked in agriculture had to spend part of the day in domestic chores, such as cooking and cleaning. Many women were not able to find farm work for the five or six months of the winter when no wage work was available. The feminization of the northern agricultural labor force as a result of emigration and off-farm work by men was documented for the Entre Douro e Minho by Goldey (1981) and for the Beira Litoral by Bouquet (1984, 70).

The loss of farm labor has been balanced in part by off-farm laborers who work occasionally in agriculture. Emigrants whose wives are farmers help with farm work during their vacations, usually in August. Construction workers often spend Saturdays and days off working on a close relative's farm. Farmers also meet labor demands in peak labor seasons with the donated labor of grown sons and sons-in-law. Small farmers sometimes exchange labor with each other to meet peak labor demands. However, the help of off-farm workers in agriculture is limited. Because the warm, dry summers are well-suited to construction work, construction workers are especially busy during the peak agricultural season.

Among other changes, there are no longer gangs of men for hire to

perform heavy tasks. Their labor was formerly available year-round, and when there were no seasonal tasks to perform in the fields, they would cut forest brush for animal stall bedding and green manure.

Although the supply of and demand for agricultural labor has decreased since the 1960s, there is still an active labor market in the parish. This market is based primarily on female workers, who are available year-round but generally work only during the peak summer season.

Capital

The previous sections described the substitution of capital and purchased inputs for labor and land that occurred in the parish during the past four decades. Although these substitutions were more evident on the larger dairy farms, an active machinery rental market and the divisibility of most purchased inputs allowed many small farms to become more capital-intensive. The increased number of improved dairy cows represents a significant addition to capital. Farmers also converted their labor to on-farm capital by expanding vineyards, digging new wells, improving irrigation and drainage, raising improved dairy calves to expand their herds, and clearing new land. This section discusses the sources of funds that facilitated the intensification of capital on farms in the parish.

Larger farmers occasionally borrow money from banks, often with government subsidies. There is also an informal credit market. People sometimes loan money to friends and relatives, often at no interest.

Investable funds are generated through emigration. Most of the emigrants have not been farmers, but some have been. Of the 81 resident dairy farm households in 1984, 50 had members who were emigrants at that time or had worked abroad. These farmers invariably returned with savings for agricultural investment.

Some farmers generated investment funds through the sale of land for home construction. Typically, this land was forestland, which sold in 1984 for over Esc 100 per square meter ($US 2,700 per acre). Forestland not zoned for construction could be purchased for as little as Esc 5 per square meter.

Profits from timber were also an important source of funds for many farms. In 1984, timber contractors cut and stacked timber at the edge of the forest, sold the logs to a sawmill, and paid the farmer Esc 2,400 per ton for pine and Esc 1,100 per ton for eucalyptus. Several farmers in the parish paid for a new tractor by selling the mature trees from some of the household forest plots. If trees are not planted, pine grows spontaneously. Pine can be sold every thirty or thirty-five years from any given stand (eucalyptus every fifteen or twenty years) with little work on the part of the farmer.

Other farm receipts have increased in importance since the 1970s. A

few farmers began marketing potatoes because of the increase in potato profits caused by the adoption of modern potato technology. With the introduction of commercial dairying in 1978, the sale of milk and dairy calves became a major source of funds for capital improvements and expansion. In this instance, government policy both increased incomes and stimulated investment, especially on the larger farms.

The availability of investment funds increased at about the same time (late 1970s) as the labor supply decreased and the cost of labor rose. The larger farmers were the most constrained by higher labor costs, since they purchased a larger proportion of their labor; but they also benefited the most from dairy policies (chapter 8). Because of the need to break labor constraints, larger farmers were willing to invest heavily in new, capital-using technologies.

Conclusions

This chapter documents the many technical, economic, social, and structural changes that have occurred in one rural parish in the Northwest. Many of the changes parallel the regional and national changes noted elsewhere in this book. The diversity of change and the complexity of the interrelated factors associated with past changes are described and analyzed. The lessons from this intensive study of one parish provide important elements for the model of technical and structural change presented in the following chapter.

The technological changes occurred as a result of the availability of new technology and of changes in factor markets and as a response to government policy. The adoption of machinery was rapid and spontaneous. It was a capital-using, labor-saving response to a decrease in the supply of labor and an increase in the supply of investment funds (because of emigration, off-farm employment, and increased farm profits).

The widespread use of land-saving inputs and the move to clear new fields were responses to a longstanding shortage of land and the importance of inheritance (relative to rent and purchase) for transferring land. The use of new inputs was made possible by the availability of new technology (such as chemical fertilizers, pesticides, tractors, well-digging machinery, and heavy equipment for clearing fields). The government dairy program of cooperative processing, price subsidies on inputs and outputs, and collective milking parlors created incentives to increase land productivity while providing the funds for land-saving inputs through increased farm profits.

Farmers accepted the dairy program because it provided a profitable, stable source of farm income. After government extension agents worked with the larger, more innovative farmers, the new dairy technology

spread rapidly through the parish. Most farmers were not contacted by the extension service but learned about dairy production from other farmers. Dairy farmers in the parish used a number of strategies to intensify their production and to expand their areas under cultivation.

Although farmers in the Northwest have an average formal education of only three to four years, they are skilled at farming. The many technical changes they have adopted in the past forty years demonstrate that they respond rationally to economic incentives. Future agricultural policy should assume that small-scale farmers are agronomically and economically sophisticated and that they understand the constraints that limit their choices.

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10. Patterns of Technical Change in the Northwest

by Roger Fox and Timothy J. Finan

The technical, structural, and socioeconomic changes documented in chapter 9 for one northwestern parish have been repeated in numerous other parishes throughout the region. This chapter continues the analysis of adjustment in northwestern agriculture by reviewing briefly some of the major regional changes that have occurred in the past three decades. It uses the knowledge of past changes to develop a generalized model of farm-level technical change in a set of representative farms. These farms are discrete units of observation on a continuum of technical and structural variations that currently exist in the Northwest. The chapter explores the paths of evolution and adjustment that link the farms. It then presents and evaluates the private profitability of the representative farms under 1983 policies in terms of the technical-change model. Finally, it examines the reasons for the wide disparities in economic performance of the representative farms.

Past Changes in Northwestern Agriculture

Many of the changes in northwestern agriculture since the 1960s have been associated with the expansion of milk production. The Northwest's two regions, the Entre Douro e Minho and the Beira Litoral, increased their milk output by about 220 percent between 1966 and 1979 (Carvalho, Barros, and Rocha 1982, 15). During the same period, the Northwest increased its share of mainland Portugal's milk output from 33 to 57 percent. The production of milk is concentrated in a narrow coastal zone, about 30 kilometers wide, running from Figueira da Foz in the south to Viana do Castelo in the north. In the Beira Litoral, for example, this coastal milkshed produces 97 percent of the region's milk (MACP-BL 1983, 9). A similar concentration is found in the Entre Douro e Minho.

In addition to major increases in milk output, production per producer and per cow also has increased. Output per producer in the Beira Litoral increased from 2,031 liters in 1967 to 7,569 liters in 1980; annual production per cow increased by about 22 percent during the same period, from 2,773 liters to 3,389 liters (MACP-BL 1983, 11). The average milk producer in 1980 therefore had 2.2 cows. Variations in production per producer and

per cow are extremely large. For example, among the thirty-one cooperatives served by AGROS (União das Cooperativas dos Produtores de Leite Entre Douro e Minho), a federation of milk cooperatives in the Entre Douro e Minho, output per producer in 1982 ranged from 25,297 liters in the Vila do Conde cooperative to 2,325 liters in the Paredes de Coura cooperative; the average for all producers was 7,424 liters (AGROS 1982, 5). This range reflects variations in farm and herd size and in productivity. Output per cow varies from over 5,000 liters per year on farms with good breeds and careful management to under 2,000 liters on farms with mixed breeds and poor management.

The rapid increase in milk production has been accompanied by major changes in the transportation, processing, and distribution of milk and milk products. The delivery of fresh milk, butter, and cheese by individual producers on foot, bicycle, and animal-drawn carts or with the help of local trains has been replaced with a modern system of collection and transformation based on cooperatives. Refrigerated bulk tanks at the producer level, refrigerated trucks for hauling fresh and processed milk, and large-scale, modern processing plants have emerged in recent years. Small-scale producers are served by a system of collective milking parlors, all mechanized and nearly all with refrigerated bulk tanks. For example, Entre Douro e Minho had 315 mechanized collective milking parlors in 1978, all but 46 of them with refrigeration (MAP-EDM 1981, 27). A large number of cows still are milked by hand, and there are still technical problems associated with milk handling and processing in the Northwest. But the changes in dairying technology during recent years have been truly remarkable.

Major changes also have occurred in the *vinho verde* wine industry. In the early 1960s, this industry was producing primarily red *vinho verde* for home consumption and for regional sale, usually in barrels and large jugs. By the 1980s, sales of red and white *vinho verde* under CVRVV regulation were about equal, and white *vinho verde* bottled in smaller containers (up to 1 liter) represented more than one-third of the regulated sales of white *vinho verde* (CVRVV 1984, 42). Regulated sales, which require a small tax and carry the official CVRVV seal, represent about 27 percent of total *vinho verde* production (CVRVV 1984, 7). Some of this white *vinho verde* was entering the world market with reasonable acceptance. Overall, the regulated sale of *vinho verde* increased about 35 percent between 1972 and 1982; however, the sale of the white *vinho verde* more than doubled while the sale of the red decreased slightly (CVRVV 1984, 42).

At the farm level, producers have reacted to the changing market situation for *vinho verde* by planting varieties that produce better-quality white wine. Variation in processing allows for the production of white or red *vinho verde* from the same grapes, but the better-quality white *vinho*

verde comes from a limited number of varities. The high-quality white *vinho verde* is produced by cooperative or private wineries with the modern equipment that is necessary for quality control. These better-equipped wineries have played an important role in developing and promoting *vinho verde*, both domestically and internationally.

Approximately 26 percent (74,000 hectares) of the agricultural area in the *vinho verde* region was devoted to grape production in the early 1980s (CVRVV 1984, 27). As described in an earlier chapter, grapes are grown on trellises (*ramadas*) on the borders of cultivated fields. The average area of grapes per farm is quite small (about 2,200 square meters), and each farm has two or three main grape *ramadas*. Production per farm averages about 1,800 kilograms of grapes, or 1,350 liters of wine.

Technical changes in corn and potato production at the parish level were described in chapter 9. Some of these changes (for example, new seed varieties and fertilizer) increased yields. But their impact does not show up in the official district and regional yield estimates, which, except for year-to-year fluctuations, remained fairly constant during the 1960s and 1970s.

The expanded use of tractors and machinery is another example of technical change in the Northwest. Between 1968 and 1983, the number of tractors in the six principal districts of the Northwest increased from 2,915 to 27,580. Data on the possession of forage choppers in three coastal districts (Aveiro, Porto, and Viana do Castelo) show an increase in the choppers from 279 in 1968 to 1,508 in 1979 (INE 1983). Although the absolute numbers of tractors and machines are low relative to the number of farms, an active rental market for machinery has resulted in a rapid increase in mechanization for many northwestern farms. The availability of machinery services through the rental market has increased labor productivity and offset some of the inherent disadvantages of small-scale agriculture in the Northwest.

This review of technical and structural changes in northwestern agriculture during the past twenty-five years supports one important conclusion: technical change in the production, processing, and handling of agricultural commodities has been relatively rapid, whereas structural change as measured by the ownership and distribution of land has occurred only slowly. The lack of significant structural change is a major concern of Portuguese policymakers and portends future adjustment problems.

A Model of Technical Change

Previous descriptions of agriculture in the Northwest leave two strong, almost conflicting, impressions. There has been considerable technical

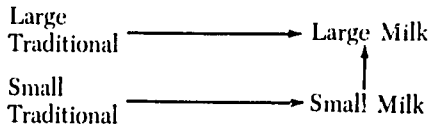
change and modernization during the past three decades. Yet a great deal of traditional agriculture still is being practiced in the area. Consequently, throughout the region, it is possible to observe modern, technologically advanced farms producing largely for the market alongside farms using traditional varieties and little or no mechanization and producing almost entirely for home consumption. Obviously, a continuum of widely variable agricultural technologies exists. The purpose of this section is to develop a descriptive and analytical model that can be used to discuss past technical changes and provide the basis for understanding the possibilities and limitations of future changes.

Besides varying in technological level, the farms in the Northwest vary in size and degree of specialization. The larger farms tend to be the more technologically advanced and the more specialized. But how did the larger, more specialized farms come into existence? Two possibilities exist.

The first is that preexisting large traditional farms took advantage of new market opportunities (for example, in milk) and new technologies and thereby became large modern farms. This possibility is based on the assumption that changes in landownership and land use have been slow and that the principal path to the large-scale modern farms is from the old estates (*quintas*) that existed (and still exist) in practically every parish. This path is referred to here as horizontal, and there is ample evidence that it has been followed frequently in northwestern agriculture.

The other possibility is a vertical path of change, by which some small traditional farms were able to modernize on a small scale and then, through a variety of strategies (purchase, rent, inheritance, and clearing of forestland), were able to expand the size of their operations. Because of the divisibility of most of the new technologies being adopted, this path is feasible; and there is evidence that, though difficult, it has been followed by some farms in the Northwest.

Change in northwestern agriculture thus has followed two possible paths—either a horizontal path with no significant change in farm size or a vertical path involving both modernization and an increase in farm size. Schematically, in terms of milk specialization, the paths are as follows:



Currently, small milk farms are dominant both in number and in level of milk production, which implies that the major path of change in the Northwest has been from small traditional to small milk farms. The future

of small farms and the possibilities of their transformation into larger farms are central issues in this chapter and the following one. Obviously, many intermediate possibilities exist. Farm sizes vary between large and very small, and levels of technology range from traditional labor-intensive to modern capital-intensive. In the application of the model, an intermediate medium milk farm has been defined and analyzed. The medium milk farm frequently is offered as the ideal-size farm for the region and is the centerpiece of recent programs to restructure and modernize milk production in the Northwest (MAP-EDM 1981; MACP-BL 1983).

The model facilitates the identification of possibilities for and constraints on technical change. The movement from small traditional to small milk farms is essentially a matter of intensification. Family labor, a purchased calf or two, better seeds, and a little more fertilizer can be combined with the availability of a collective milking parlor to transform a small traditional farm into a small milk farm. No additional land is required, and the increase in capital is minimal.

The movement from large traditional to large milk farms also requires no additional land. However, the constraints on family labor, the need for additional power, and the economies and timeliness of machinery use result in a transformation to a more capital-intensive system of milk production. Investments in machinery, a milking parlor, a good-quality herd, and permanent pasture require substantial outside credit or a long period of accumulating savings.

Finally, the movement from small milk to large milk farms faces both the capital constraint on increased mechanization and the land constraint. Furthermore, management requirements are much greater on the larger farms. Clearly, the number of farmers who can make this transition currently is limited.

Modernization of grape production in the Northwest has not been nearly so extensive as that of milk. Except for the port wine area, the market for wine has not been nearly so stable or guaranteed as the market for milk. Moreover, the production risks of frosts and other climatic problems, as well as disease, are probably greater for grapes than milk, notwithstanding the problems of brucellosis and pneumonia among dairy cattle. The Portuguese government has not subsidized investment or developed the infrastructure for wine to the same extent as for milk.

The path of modernization for *vinho verde* grape production, therefore, has been primarily one of modification of the existing small-scale vineyards. New varieties are substituted for older ones, the area planted to grapes is expanded if the soil and climate are particularly favorable, and the grapes are processed by the cooperative winery rather than at home. Although there are several programs for the conversion and modernization of grape production in the *vinho verde* region, few farmers have

made the large investments required to remove existing vines, plant new varieties on low support structures, and purchase the necessary equipment for increased mechanization. Even where some of these changes are made, the area devoted to modern grape production remains small.

Consequently, the basic model of farm-level technical change is one involving milk production. It portrays the dynamics of change for milk and the complementary and supplementary crops that are produced with milk. It allows for the identification of constraints and the links with the nonfarm economy through the markets for factors and products. It does not deal explicitly with the problems of land fragmentation, but it gives considerable attention to the size of the operating unit and its impact on technical change.

Six Representative Whole-Farm Systems in the Northwest

The model for farm-level technical change provides a sound basis for empirical investigation. Six representative whole-farm systems with different, well-defined technical and structural characteristics have been identified and analyzed. The structure of these farms in terms of land use is given in Table 10.1. The characteristics of each of the commodities produced in these systems were described in detail in chapter 8. The principal input characteristics of each type of system are summarized in Table 10.2. These characteristics represent the technological and structural variations previously described for northwestern agriculture.

Although large traditional farms are still present in the Northwest, they were omitted from the formal analysis because of incomplete information on their economic activities and because so few still exist. These reminders of the past use traditional methods of cultivation, often operate with sharecroppers, and appear to have underutilized land. Their failure to modernize seems to involve a complex set of factors, including advanced age of the owners, lack of entrepreneurial skills, absentee ownership, lack of investment capital, and minimal knowledge of or interest in modern agriculture. Some large traditional farms represent the remnants of landed aristocratic families from the last century.

Private Profitability of the Representative Whole-Farm Systems, 1983

The analysis of private profitability of the representative whole-farm systems follows the method discussed in chapter 8, except that the individual commodity systems are combined according to their participation in the whole-farm crop and rotation plan. The per hectare commodity system results in chapter 8 thus are scaled up or down to reflect their

TABLE 10.1. *Land-Use Patterns and Yields for Six Representative Whole-Farm Systems in the Northwest*

System	Yield[a]	Area (in Hectares) Summer	Winter
Small Traditional			
Milk cows (2)	1,000	—	—
Corn/beans	3,000/250	0.7	0.0
Ryegrass	30,000	0.0	0.8
Potatoes	15,000	0.1	0.0
Grapes	11,000	0.2	0.2
Totals		1.0	1.0
Small Milk			
Milk cows (2)	3,400	—	—
Corn/beans	4,000/500	0.7	0.0
Ryegrass	30,000	0.0	0.9
Potatoes	20,000	0.1	0.0
Grapes	11,000	0.2	0.2
Totals		1.0	1.1[b]
Medium Milk			
Milk cows (12)	4,000	—	—
Corn silage	40,000	2.4	0.0
Ryegrass	30,000	0.0	2.8
Potatoes	20,000	0.4	0.0
Grapes	11,000	0.2	0.2
Totals		3.0	3.0
Large Milk			
Milk cows (36)	5,000	—	—
Corn silage	48,000	6.0	—
Ryegrass	60,000	0.0	6.5
Potatoes	85,000	3.5	3.5
Grapes	20,000	0.5	0.0
Totals		10.0	10.0
Small Wine			
Milk cows (2)	1,000	—	—
Corn/beans	3,000/250	0.5	0.0
Ryegrass	30,000	0.0	0.8
Potatoes	15,000	0.1	0.0
Grapes	11,000	0.4	0.4
Totals		1.0	1.2[c]
Modern Wine			
Grapes	10,000	2.0	2.0

SOURCE: PES team estimates.

[a]In liters per cow for milk and kilograms per hectare for everything else. For ryegrass, 20 metric tons harvested and fed as green fodder and 10 metric tons of hay. For mixed forages, 40 metric tons harvested and fed as green fodder and 20 metric tons of hay.

[b]Includes 0.1 hectare of ryegrass planted under the grapevines.

[c]Includes 0.2 hectare of ryegrass planted under the grapevines.

— = not applicable.

contribution to the whole-farm system. An easy example is the 0.1 hectare of potatoes on the small traditional farm; its costs and returns are derived by taking 0.1 times the appropriate per hectare cost and return items in the traditional potato system presented in chapter 8. More complex calculations are required for corn, because part of the costs are included in milk, for which corn is a farm-produced input, and the re-

TABLE 10.2. *Characteristics of Six Representative Whole-Farm Systems in the Northwest*

System	Area (in Hectares)	Direct Labor (in Hours)		Tractor Time (in Hours)	Animal Traction Time (in Hours)[a]	Fertilizer (in Kilograms)			Limestone (in Kilograms)	Mixed Feeds (in Kilograms)	Number of Adult Cows
		Men	Women			Nitrogen[b]	Phosphorus	Potassium			
Small traditional	1	575	1,477	6.7	742	113	14	14	0	0	2
Small milk	1	628	2,017	40.5	0	146	53	53	750	610	2
Medium milk	3	1,541	916	595.0	0	1,000	393	272	3,000	12,060	12
Large milk	10	3,712	2,240	2,395.0	0	3,478	1,873	1,288	11,250	53,370	36
Small wine	1	622	1,434	5.7	742	99	14	14	0	0	0
Modern wine	2	782	428	123.0	0	158	98	98	1,000	0	0

SOURCE: PES team estimates.

[a]Both figures include animal time required for principal crops plus 500 hours of general traction time.

[b]For medium milk and large milk systems, includes urea used in making corn silage: 138 units of N for a medium milk farm and 345 units of N for a large milk farm.

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maining costs and returns—for corn used as grain, not fed to animals—have to be calculated and included in the whole-farm results.

The structure of private costs and returns for the whole-farm systems illustrates the importance of the milk activity in all of them except the specialized modern wine system. The milk activity increases in importance from 49 percent of the total output value for the small traditional milk farm to 97 percent for the large milk farm (Table 10.3). Milk's claim on labor, capital, and tradable inputs increases concomitantly with the value of output. The specialization in milk, as defined in the model of technical change and in the descriptions of the representative milk farms, is evident in Table 10.3.

The private profitability estimates for the six representative whole-farm systems demonstrate the incentives for technical change and specialization postulated in the model (Table 10.4). The larger, more modern systems are much more profitable on a per hectare and per farm basis. Even though the small milk farm is unprofitable, it is not nearly so unprofitable as the small traditional farm, and it represents an improvement over the

TABLE 10.3. *The Structure of Private Costs and Revenues for Five Representative Whole-Farm Systems in the Northwest, 1983 (in Percentages)*[a]

System	Labor	Capital	Tradable Inputs	Revenues
Small Traditional				
Milk	67	46	38	49
Corn/beans[b]	15	13	18	19
Potatoes	4	3	27	11
Wine grapes	14	38	18	21
Small Milk				
Milk	72	50	55	62
Corn/beans	14	12	18	18
Potatoes	3	3	16	8
Wine grapes	36	36	11	14
Medium Milk				
Milk	87	88	89	89
Potatoes	6	6	10	8
Wine grapes	7	6	1	3
Large Milk				
Milk	97	98	97	97
Potatoes	3	2	3	3
Small Wine Grape				
Grapes	23	48	32	40
Milk	65	42	35	42
Corn/beans	8	7	9	9
Potatoes	4	3	24	10

SOURCE: PES team estimates.

[a]The modern wine grape system is omitted because it produces only one final product, grapes. Except for rounding errors, the column sums for each whole farm system equal 100.

[b]All corn/bean figures represent excess corn and beans—the amount not used in the milk activity.

TABLE 10.4. *Private Costs, Revenues, Returns, and PCRs of Six Representative Whole-Farm Systems in the Northwest, 1983 (in Escudos per Hectare)*[a]

System	Labor	Capital	Tradable Inputs	Revenues	Returns to Land and Management	Private Cost Ratio[b]
Small traditional (1 hectare)	149,300	64,117	34,860	198,657	−49,620	1.30
Small milk (1 hectare)	194,009	68,488	57,393	296,305	−23,585	1.10
Medium milk (3 hectares)	102,196	138,333	178,141	489,768	71,098	0.77
Large milk (10 hectares)	82,422	135,694	209,976	487,140	59,048	0.79
Small wine grape (1 hectare)	154,075	69,324	33,058	231,679	−29,778	1.15
Modern wine grape (2 hectares)	45,084	57,298	45,477	391,650	243,791	0.30

SOURCE: PES team estimates.
[a]Costs and returns measured at the farm level.
[b]Ratio of the private costs of capital and labor to the value of output minus tradable input costs. See chapter 2 for details.

traditional technologies. The per hectare returns to land and management on the medium and large milk farms are about the same. But because of its greater size, the large milk farm has a much higher total return. The incentives for wine grape specialization are clearly demonstrated by the data in Table 10.4.

The private cost ratios (PCRs) for the different whole-farm systems also are given in Table 10.4. A PCR greater than 1 indicates that the costs of labor and capital, measured at their full private opportunity value, are greater than the value added in market prices (that is, the value of output minus tradable input costs). If the opportunity cost of land were included, the PCRs would be somewhat larger. The interpretation of PCRs greater than 1—such as those for the three small whole-farm systems—is that owners of land, labor, and capital would be better off employing their resources in activities that pay full opportunity costs to these factors. The medium milk, large milk, and modern wine grape farm systems were profitable in 1983 and were capable of paying more than full opportunity costs to labor and capital. Although there has been some shift to the three profitable types of farm systems, the vast majority of the agricultural resources in the Northwest are still devoted to the small-scale production represented by the three types of small farm systems.

Adjustment Problems in Northwestern Agriculture

In studying the dynamics of technical and structural change, it is important to understand why, given the poor economic performance of

small farms relative to larger farms, there has not been more adjustment in northwestern agriculture. The forces limiting adjustment already have been mentioned and need only to be integrated at this stage.

The joint land and capital constraint is certainly important. Limitations on the acquisition of land imposed by inheritance practices, uncertainty in the land rental market, inflated land prices because of nonfarm demand, and traditional family ties to land are compounded by credit and capital constraints. Most small farmers do not have access to formal credit, the government has given low priority to credit lines for land purchases, and Portuguese farmers, especially those with limited land, seem to have a strong aversion to credit. All of these constraints limit the ability of small farmers to expand farm size.

The possibilities of financing land acquisition and new technologies from farm income also are extremely limited. Estimates of the annual family cash income for the three small farm systems range from 62 contos ($US 560) for the small traditional farm to 122 contos ($US 1,100) for the small milk farm. Although small northwestern farms are highly self-sufficient in food production, family consumption expenditures conservatively required at least 1 conto ($US 9.10) per week in 1983. Given this assumption, the representative small farm families had from 10 to 70 contos left over for investment. In 1983, an average-quality pregnant heifer cow cost about 60 contos and a calf sold for 15 contos; agricultural land cost much more.

A cow thus cost more than the potential annual savings from agriculture by many small farmers. Without reliable sources of credit or substantial off-farm income, the possibilities of expansion are severely limited. Land rental is a possibility, and many farmers do rent small plots of land. However, the possibility of expanding available cropland from 1 hectare to 3 hectares on the basis of rented land is unlikely. Land rents, which in 1983 averaged about 23 contos per hectare in the Northwest, varied widely, depending on the size, location, access, and quality of the plot. If planned or unplanned consumption expenditures (for example, unexpected medical expenses) were much higher than 1 conto per week, the ability to invest from farm income would be completely foreclosed. For these reasons, off-farm income is almost a necessity for the survival of small farm families in the Northwest, especially those on small traditional farms.

The only other source of farm income that appears to offer the small farmer a chance for expansion and modernization is forestland. Two possibilities exist. Farmers can harvest their timber and then reforest, or they can convert their forestland to cropland. Both alternatives have their limitations. Timber is available only after a long period of waiting, and not all forestland is suitable for cropland. However, as demonstrated in chap-

ter 9, this strategy has been followed by some small farmers in the Northwest.

Nonfarm sources of funds for expansion and modernization of agriculture come primarily from local, off-farm employment and migration. The importance of these sources of funds has been discussed in chapter 9 and by Pearson, Monke, and Avillez (1985) and Fox et al. (1984, 65–72). The 1983 survey of 198 farms in five northwestern parishes found that 37 percent of the farmers investing in agriculture had access to emigrant remittances; nearly 44 percent of all emigrant-influenced households had made major investments in agriculture during the previous five years (Fox et al. 1984, 67–68). Local merchants and professional people also invest in agriculture by developing hobby or part-time farms, some with modern technologies, but few of these types of farms exist.

The ability to expand and modernize in milk production is limited by the policies of the milk cooperatives and unions. For a number of reasons, the collection of milk for processing has been limited to the coastal zone (Langworthy 1986). Consequently, for traditional farms that lie outside that zone, the possibilities for milk specialization are virtually precluded. Community action is required to establish a collection post or a collective milking parlor. Private parlors established a long distance from the local cooperative have difficulty getting their milk picked up. Although considerable geographic expansion occurred during the 1960s and 1970s, greater coverage has become more difficult in recent years because the unions have attempted to concentrate their activities and discourage the establishment of new collection posts and collective milking parlors.

Another way to interpret the results in Table 10.4 is to consider the degree to which resources, especially labor and some capital items, are trapped in small-scale agriculture. The implication of trapped resources is that the opportunity costs used to evaluate family labor and owned capital do not apply in all cases. For example, the opportunity cost of female labor at Esc 62.5 per hour in 1983 might not be relevant to many women working on small farms. Local jobs paying that wage are not always available at the time some women desire to work. The number of local jobs available at the opportunity wage might not be sufficient to encourage women to take the risk of entering the job market. Age and health conditions also would make the actual opportunity wage much lower for many women. Family values and customs could prevent some women from entering the wage labor force. The fact that children provide part of the labor included in the budgets also contributes to the overvaluation of labor measured by average opportunity costs. If the actual opportunity wage for children could be estimated, it would be much lower than the imputed wages for the jobs they perform. All of these factors exist to some

extent in the Northwest and contribute to maintaining labor on small farms, where the returns are significantly below the average opportunity costs of labor.

Another dimension of the labor question concerns total family income. If all members of the family must leave the farm in order to seek full opportunity costs for that part of their labor employed in agriculture, total family income might fall. This decrease in income is particularly likely if some members of the family, usually adult males, have local off-farm jobs. Following migration to the city, only one or possibly two members of the family would be employed. Moreover, the family would have to give up the significant amounts of food it normally produced. For these reasons, single adults account for most of the migration and emigration. These labor market constraints also slow the rate of expansion in farm size by causing the maintenance of many small-scale units.

Certain capital items, such as the oxcart, the wooden harrow, the traditional plow, and the single-row hand-drawn planter, essentially are fixed in traditional agriculture. Their value in the more modern systems is near zero. Since these fixed inputs last for many years, many farmers are unwilling to abandon them, and they continue to practice traditional agriculture with its apparent low return on investment.

When consideration of the numerous constraints on expansion is combined with the fixity of some types of labor and capital, it is possible to explain the wide variations in returns exhibited in Table 10.4. At the same time, a remarkable number of technical innovations have transformed parts of northwestern agriculture during the past twenty-five years. Most of these innovations, however, have occurred in the coastal zone and have allowed small traditional farms to evolve into small milk farms, the path of change that has faced the least constraint and that has been fostered by government policy. The poverty of the large number of remaining traditional farms suggests that this transformation is far from complete.

Summary and Conclusions

A model of technical change in northwestern agriculture was developed in this chapter. The model is based on technical changes that have occurred during the past thirty years, especially in milk production. The transition of a large number of farms from traditional production technologies to more modern systems has followed two paths, identified in the model as horizontal and vertical. The horizontal path involved modernization and specialization without change in farm size, whereas the vertical path involved both modernization and an increase in farm size. The horizontal form of technical change, illustrated by the emergence of the small

milk farm, has been the more prominent path of modernization in the region. Land, management, and capital constraints have limited the ability of farmers to increase the size of their farms.

The model was tested using 1983 data on six representative whole-farm systems—four for milk and two for wine. These systems were defined to represent different points along the horizontal and vertical paths of technical change. They are also representative of existing farms in the region. The results of the analysis of the representative systems demonstrated the economic forces underlying past technical changes, especially in milk production. The more modern systems clearly outperformed the traditional systems, and the larger representative farms had greater profits per hectare than the small farms.

The poor relative performance of the small-scale farmers was explored in terms of the constraints limiting their ability to increase farm size. For many of these farmers, limitations on the acquisition of land imposed by inheritance practices, uncertainty in the land rental market, inflated land prices because of nonfarm demand, and traditional family ties to land were compounded by credit and capital constraints. The lack of access to formal credit, a strong aversion to any form of credit, and the limited ability to finance land acquisition from farm income have inhibited increases in farm size. Off-farm income from emigration or local employment has provided funds for expansion and in some cases is a necessity for the survival of small farm families, especially those on traditional farms. Finally, a number of reasons were offered to explain why part of the labor and capital in agriculture is trapped in small-scale farming. The result of the economic incentives for change has been fairly rapid technical change in agriculture but limited structural change.

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11. Future Technical and Structural Adjustments in Northwestern Agriculture

by Roger Fox and Timothy J. Finan

The farm-level technical and structural changes discussed in the previous two chapters were associated with farmers' reactions to the expected private profitability of the principal agricultural activities in the Northwest. Changes in private profitability, in turn, reflected changing market conditions for material inputs, factors of production, and outputs, all of which have been influenced significantly by macroeconomic policies and commodity policies. In this chapter, the whole-farm analysis continues with an investigation of future private profitability under expected EC and Portuguese policies. Social profitability and the explicit effects of policy on the six representative farms are presented for the base year (1983) and for selected years during the transition period (1986, 1991, and 1996). Implications based on the results are derived on an aggregate basis and for certain affected groups of farmers. Alternative strategies and policies for addressing the most severely affected groups are evaluated.

Private and Social Profitability, 1983–96

The commodity system results have been aggregated to represent whole-farm private and social profitability through use of the methods presented in chapter 2 and the activity weights established in chapter 10. The results, which are based on final product values (for example, escudos per kilogram of cheese), are presented on a per hectare basis in order to facilitate comparisons among the representative whole-farm systems (Table 11.1). Because of the importance of the milk activity in the whole-farm milk systems, the results in Table 11.1 are similar to those presented in chapter 8. For the modern wine grape farm, which specializes entirely in grape production, the results are identical to those in chapter 8; consequently, less attention will be given here to that system.

The presentation of private and social profits and of the net effects of policy at the farm level implicitly assumes that all the profits or losses and all the subsidies or taxes accrue to the farmers. The profitability of the postfarm activities (transportation and processing) is thus zero. For the whole-farm systems in the Northwest, this assumption is realistic. For some of the commodities, such as corn for grain, potatoes, and traditional

TABLE 11.1. *Private and Social Costs, Revenues, Returns, and Net Policy Effects for Six Representative Whole-Farm Systems in the Northwest, 1983–96 (in Thousands of Escudos per Hectare)*

System and Year	Private			Social			Net Policy Effects
	Total Costs	Total Revenues	Returns to Land and Management	Total Costs	Total Revenues	Returns to Land and Management	
Small Traditional							
1983	271	231	−40	310	177	−133	+93
1986	264	224	−40	298	160	−138	+98
1991	278	208	−70	312	208	−104	+34
1996	294	193	−101	327	193	−134	+33
Small Milk							
1983	401	408	7	444	246	−198	+205
1986	391	396	5	428	208	−220	+225
1991	411	339	−72	445	339	−106	+34
1996	433	294	−139	466	294	−172	+33
Medium Milk							
1983	577	751	174	695	388	−307	+481
1986	593	733	140	676	323	−353	+493
1991	598	596	−2	673	596	−77	+75
1996	609	501	−108	682	501	−181	+73
Large Milk							
1983	604	778	174	743	373	−370	+544
1986	627	760	133	723	300	−423	+556
1991	628	605	−23	714	605	−109	+86
1996	636	497	−139	719	497	−222	+83
Small Wine Grape							
1983	418	398	−20	476	348	−128	+108
1986	410	395	−15	462	336	−126	+111
1991	425	377	−48	476	377	−99	+51
1996	441	362	−79	492	362	−130	+51
Modern Wine Grape							
1983	453	698	245	547	698	151	+94
1986	451	698	247	537	698	161	+86
1991	455	698	243	541	698	157	+86
1996	461	698	237	546	698	152	+65

SOURCE: PES team estimates.
[a]Plus (+) equals subsidy.

wine, all of the processing activities are done on the farm and only minor costs are associated with off-farm transportation. For the other commodities, such as milk and quality wine, the transportation and processing are provided by cooperatives, which represent, in theory at least, an extension of farmer ownership to nonfarm production and, consequently, participation in nonfarm profits and losses. However when all or part of the private losses of the cooperatives are absorbed by the government, the assumption breaks down; in effect, the cooperative members receive an additional subsidy. The extent of this form of subsidization is not known.

The degree of subsidization of the whole-farm systems in the North-

west is expressed in the estimates of the net effects of policy (Table 11.1). In 1983, the major portion of these transfers was associated with product prices, especially for cheese. For example, 79 percent of the 205 contos per hectare subsidy to the representative small milk farm in 1983 was due to the difference between private and social (world) product prices; furthermore, 94 percent of this difference was associated with protective policies that raised domestic cheese prices. A similar situation existed for the medium and large milk farms. The remainder of the transfers, those not represented by product prices, was due to Portugal's interest rate policies and subsidies on certain tradable inputs, such as fertilizer and mixed feeds (see chapter 8).

The extremely high level of subsidization of the representative medium and large milk farm systems in 1983 is demonstrated in Table 11.1. The subsidies represented 64 and 70 percent of the total private revenues of these systems; on a per hectare basis, the transfers were greater than the total private revenues of the small traditional, small milk, and small wine grape farm systems. On a per farm basis, the differences were even larger. For example, the 3 hectare medium milk farm system received subsidies that were seven times larger than those for the 1 hectare small milk farm systems. These differences are closely associated with the higher levels of milk production on the larger farms.

The 1983 private returns presented in Table 11.1 follow the pattern of the farm-level results given in Table 10.4. In 1983, the small traditional and small wine grape farm systems showed losses while the remaining representative farms were profitable. An absence of government support would have made these two small farm systems even more unprofitable and would have resulted in private losses for all but the modern wine grape farm system. Furthermore, without government support, the per hectare and per farm losses would have been largest for the medium and large milk farm systems.

With Portugal's entry into the EC in 1986, the expected profitability situation for all but the modern wine grape farm system starts to deteriorate. As Portuguese prices for cheese and corn are lowered in order to harmonize with EC prices by the end of first phase of the transition period (1991), real total private revenues will decline rapidly for five of the representative farms. From 1983 to 1991, the expected reductions in real total receipts for the representative small traditional, small milk, medium milk, large milk, and small wine grape farm systems are 10, 17, 21, 22, and 5 percent, respectively. The greater the specialization in milk, the larger the absolute and percentage decline in total farm receipts. Real total revenues will continue to decline from 1991 to 1996 in accordance with the projected decline in real EC prices for milk and corn.

At the same time that revenues will be falling, costs will be increasing slowly, primarily as a result of the anticipated increase in agricultural wage rates. The majority of the farm systems in the Northwest thus will be caught in a classic price-cost squeeze, and by 1991 all but the modern wine grape farm system have will have negative returns to land and management. The expected private losses will be even larger by 1996, and although the medium and large milk farm systems no doubt could survive under the projected 1991 conditions, the situation by 1996 appears to be intolerable for all milk producers unless the price situation changes, cost-reducing innovations are adopted, or new transfer (subsidy) programs are introduced.

To some extent, the assumption of increased agricultural wages for the three representative small farm systems is artificial, since most of the labor is provided by the farm families. Returns to family labor on these farms actually will decline, and there will be considerable pressure on the farm families to look for other agricultural activities or to get out of agriculture. For example, under the assumption that all of the unskilled labor used on the representative small milk farm is family labor, the return to family labor (including management) and land will fall from 181 contos in 1983 to 109 contos in 1991 and 58 contos in 1996. It is unlikely that many small milk farmers will continue to apply their two basic resources, land and labor, to the activities that currently are comprised in the representative small milk farm.

With the harmonization of Portuguese and EC output prices in 1991, the level of subsidization of the milk and small wine grape farm systems will drop substantially (Table 11.1). The net transfers that remain after 1991 will be due to the continued interest rate subsidies on capital and minor subsidies on tradable inputs, which together will more than offset the taxes on skilled labor. Although the real Euro-social output prices will be higher than the world prices used for social valuation in 1983, the milk and small wine grape farm systems will continue to be socially unprofitable during the second phase of the transition (1991–96).

The one bright star on the horizon is the modern wine grape farm system. However, as explained in detail in chapter 8, the scope for expansion of this agricultural system needs to be considered with caution because of the current European surpluses of wine and the difficult cash-flow problem associated with the conversion from the small wine grape system to the modern wine grape system. Nevertheless, the results illustrate the potential benefits of increasing the proportion of white *vinho verde*. Since the private costs per hectare for the small and modern wine systems are about equal, the greater profitability of the modern system is derived from the higher output price for white *vinho verde*.

Aggregate Impacts and Implications

The previous section of the chapter clearly indicates the difficult future for five of the six whole-farm systems that represent a significant portion of the agricultural activities in northwestern Portugal. Selected data from the milk cooperatives, a study of the *vinho verde* region, and Ministry of Agriculture reports facilitate estimation of the regional impacts.

Data for 1982 from the AGROS union of milk cooperatives illustrate the situation in the Entre Douro e Minho region just before the base year of this study. The union processed milk and provided other services to 31 local cooperatives with a total of 28,643 member farms. These farms represented about 43 percent of the total farms in the region consisting of more than 1 hectare (INE 1979). In 1982, AGROS received 212.5 million liters of milk from its members and 3.4 million liters from 425 nonmember producers (AGROS 1982). The milk was received from collective milking parlors, private milking parlors, and local collection posts (where individual producers bring their milk, usually on foot, for centralized pickup).

The data in Table 11.2 indicate the importance of the three sources of milk received by AGROS in 1982. The collective milking parlors provided 40 percent of the milk and represented 35 percent of the producers. Average annual production per cow and per producer was 3,544 liters and 8,511 liters, respectively. The average number of cows per producer was 2.4. Therefore, the AGROS members who milked their cows at the collective milking parlors were, on average, very similar to the representative small milk farmers; they averaged two cows per farm and 3,400 liters of milk per cow per year.

TABLE 11.2. *Milk Production Data for Members of the AGROS Union of Cooperatives, 1982*

Item	Milking Parlors		Collection Posts[a]
	Collective	Private	
Number of parlors	480	1,235[b]	—
Number of producers	9,913	1,235	17,495
Number of cows	23,809	n.a.	n.a.
Milk production (in thousands of liters)	84,372	53,973	74,154
Percent of total production	40	25	35
Percent of total producers	35	4	61
Production per producer (in liters)	8,511	43,703	4,239

SOURCE: União das Cooperativas dos Produtores de Leite de Entre Douro e Minho (AGROS), *Relatorio e contas* (Portas Fronhas 1982).

[a]Not presented explicitly in the AGROS report; derived by subtraction of the collective and private parlor figures from the totals.

[b]Includes 560 parlors with refrigerated storage and 675 without.

— = not applicable.

n.a. = not available.

The 1,235 producers with private milking parlors, representing 4 percent of the AGROS members, delivered 25 percent of the milk (Table 11.2). Their average annual production of 43,703 liters per producer was close to the 48,000 liters attributed to the representative medium milk farm. This group includes a few large milk producers as well as a number of producers with lower output than that of the hypothetical medium milk farm.

In 1982, the majority of the members of AGROS (61 percent) delivered their milk to local collection posts. These farmers, who milk their cows by hand, delivered 35 percent of the milk processed by AGROS (Table 11.2). Their annual production per farm was 4,239 liters, about one-half of the average for members who used the collective parlors but over twice the average production for the representative small traditional and small wine grape farms (2,000 liters per farm). Some of the producers who delivered their milk to the local collection posts had characteristics similar to those of the representative small milk farms. However, many of these farms resembled the traditional milk and wine grape farms.

The AGROS data suggest that in the Entre Douro e Minho about 75 percent of the milk production and 96 percent of the milk producers are associated with small farms similar to the small traditional, small milk, and small wine grape farms used in this study. Only 4 percent of producers fall within the range of the representative medium and large milk farms. Furthermore, the region's milk producers are concentrated in the narrow coastal zone that extends a maximum of 30 kilometers from the Atlantic Ocean.

Although the data from the Beira Litoral are not so complete, the picture is quite similar to that of the Entre Douro e Minho. In 1980, about 30,000 milk producers constituted 29 percent of the farms of more than 1 hectare in the region (INE 1979; MACP-BL 1983, 9). Production in the coastal zone, which represented 97 percent of the region's milk production, was 227 million liters in 1980. There were about 67,000 cows in the Beira Litoral. Production per cow was 3,389 liters, almost identical to that of the representative small milk farms. There were 2.23 cows per producer, and the average production per producer was 7,569 liters. Consequently, the averages for the Beira Litoral are similar to those for the representative small milk farms even though there is considerable variation around these averages.

Data from one of the large milk cooperatives in the Beira Litoral, PROLEITE (Cooperativa Agrícola de Produtores de Leite do Centro Litoral), give an indication of the variations in farm size and milk production. In 1983, the 5,000 members of PROLEITE had an average of 2.2 cows, virtually the same as the regional average, but production per cow and per producer was considerably higher than the regional averages:

4,472 liters per cow and 9,754 liters per producer. The 156 producers with private milking parlors were 3 percent of the members but owned 20 percent of the cows, or an average of 14 cows per producer. As in the Entre Douro e Minho, PROLEITE members with private milking parlors were, on average, similar to the representative medium milk farms. The remaining 4,844 milk producing members of PROLEITE delivered their milk through 239 collective milking parlors and 50 collection posts; they had an average of 1.8 cows per producer. In 1983, 70 percent of the cows owned by PROLEITE members were milked in collective milking parlors.

It is clear from the Entre Douro e Minho and Beira Litoral data that medium and large milk farms represent only about 3 to 4 percent of the producers but account for 25 percent or more of milk production. The remaining production is provided by approximately 56,700 small farms with about 2 cows per farm. This group of small milk producers is in extreme jeopardy as a result of the impending policy changes brought about by Portugal's entrance into the EC.

The production of grapes in the *vinho verde* region occupies about 74,000 hectares, or approximately 26 percent, of the agricultural land area in the region (CVRVV 1984, 28). The *vinho verde* region is almost entirely in the Entre Douro e Minho; only small portions of it extend into the Beira Litoral and the Trás os Montes. Average total wine production for the five-year period 1977–82 was 466.3 million liters. Home consumption is estimated to have utilized 38 percent of this production, and slightly over 35 percent of the total production was marketed directly from producers to retailers or consumers (CVRVV 1984, 7). Consequently, only about 27 percent of the production was marketed under the control of the CVRVV, and over half of this wine (58 percent) was sold within the *vinho verde* region. Only 5 percent of regulated production, or about 1.6 percent of total production, entered the export market.

In 1983, the twenty-one wine cooperatives in the *vinho verde* region had 6,584 members, representing about 3 percent of the 212,000 wine grape producers in the region (Mendes 1985, 20). The cooperatives produced 16.5 percent of the regulated *vinho verde* production, or 4.5 percent of the total production, between 1979 and 1983; 36 percent of their production was white *vinho verde* and 64 percent was red. Consequently, the proportion of white to red *vinho verde* actually produced by the cooperatives was considerably less than what was assumed for the representative modern wine grape farms (80 percent white, 20 percent red). But this assumption was made purposefully, to reflect the trend to increased white *vinho verde* production. For example, in the regulated market, the proportion of white *vinho verde* went from 22 percent in the period 1962–67 to 51 percent in the period 1977–82 (CVRVV 1984, 10).

The grapes not processed by the cooperatives are processed by private

commercial wineries or by individual producers. In 1981, the cooperatives and the private commercial wineries produced 13.9 and 19.3 percent, respectively, of the regulated wine (CVRVV 1984, 35). About two-thirds of the regulated wine was thus produced by individual grower-producers.

A major concern of the cooperatives is that they have a great deal of underutilized capacity for making and bottling wine. From 1979 to 1983, the average utilization of their wine-making capacity was 50 percent; the utilization of their bottling capacity was even less—17.8 percent in 1982 (Mendes n.d., 4, 5). This excess capacity, reflecting the difficulty that wine cooperatives have had in attracting members, increases the fixed costs per liter for making wine from grapes delivered by current members. It is perhaps one of the reasons that 25 percent of the members of the wine cooperatives did not deliver any grapes to the cooperatives during the 1980–82 seasons (derived from data in CVRVV 1984, 36).

The grape and wine production averages per producer in the *vinho verde* region, as determined by a survey of 44 percent of the producers, are quite similar to the averages for the wine grape activity in the representative traditional, small milk, and medium milk whole-farm systems. The averages for the 152,000 *vinho verde* producers surveyed were 2,171 square meters of grapes and 1,351 liters of wine per producer, compared to 2,000 square meters of grapes and 1,650 liters of wine in the model systems (CVRVV 1984, 29). Yields on the model farms are therefore higher than the average from the survey.

The representative small wine grape farm that hypothetically has its grapes processed at a cooperative has 4,000 square meters of grapes and a total production of 3,300 liters of wine, 90 percent of which is red *vinho verde*. Its total production is about 15 percent less than the average wine production per cooperative member (3,915 liters) who delivered grapes from 1980 to 1982 (CVRVV 1984, 36). The cooperatives produce a smaller proportion of red *vinho verde* (64 percent between 1979 and 1983) than do the model farm.

Data are not available to determine the distribution of wine cooperative members by size of farm or by volume of wine production. Consequently, it is not possible to estimate the aggregate number of farms that are similar to the representative small wine grape and modern wine grape farms. The opinion of technicians familiar with the *vinho verde* industry is that a very small proportion, perhaps less than 1 percent, of the cooperative members have grape farms similar to the modern wine grape farms. In addition, a few individual producers who process and bottle their own wine have adopted the modern wine grape technology. The important point, however, is that the cooperatives account for only 4 to 5 percent of the total *vinho verde* production, and therefore the vast majority of the

production still comes from small, mixed farms that process their own grapes. In this study, these farms are represented by the small traditional and the small milk farms—farms that face a difficult future within the EC.

Potential Adjustments

Farmers will respond in two ways to the anticipated changes in their economic well-being. They will be forced to seek structural and technical solutions to their problems. The structural solutions involve changes in farm size and migration and improvements in infrastructure. The technical solutions include new technologies for existing crop and livestock production, changes in crop mixes, and the introduction of new crops. In reality, these changes occur jointly, and in the future they will determine the characteristics of agriculture in the Northwest. This section discusses the potential for and implications of some of these structural and technical adjustments.

Structural Adjustments

Given the aggregate estimates of the regional production of milk and wine, it is possible to make some simple calculations about the impact of changing the structure of farms in the Northwest. For example, in the Entre Douro e Minho, if all the milk processed by AGROS had been produced by farms with average production equal to that of the representative medium milk farm, only 4,500 farms would have been needed in 1982 (assuming that the distribution about the mean was normal). This number is 15 percent of the actual number of dairy farms that delivered milk to AGROS in that year. A similar estimate for the Beira Litoral indicates that about 4,700 milk producers would have been needed to produce what 30,000 producers actually delivered in 1980.

The implications for land use are also significant. The 9,200 dairy farms (4,500 in the Entre Douro e Minho and 4,700 in the Beira Litoral) that could have produced all the milk in the Northwest would have required 27,600 hectares of cropland to support their cows. This amount of cropland is about 47 percent of the estimated 59,000 hectares of cropland used for milk production in the early 1980s (the estimate is based on 59,068 producers using an average of 1 hectare to maintain 2.2 cows per producer). Because of higher production per cow, the number of cows required also would have decreased, but only by 13 percent. If this hypothetical structure were to become reality, some of the "excess" land and labor could be used for additional milk production for the growing demand, for other agricultural products, or for nonfarm activities. The medium milk farm, which has been identified by Ministry of Agriculture officials as the ideal dairy farm for the Northwest, is also the best perform-

er among the representative milk farms in this study. But transition to a structure based on average dairy farms with 3 hectares of land and 12 cows implies major adjustments that are not likely to occur in the near future.

Adjustments in the wine industry toward production systems similar to the modern wine grape system also imply a major restructuring of agriculture in the Northwest. If the average *vinho verde* grape farm in 1983 had had 2 hectares of land and had produced the equivalent of 15,000 liters of wine, the 1983 output of *vinho verde* could have been supplied by 30,400 producers rather than the 212,000 who actually grew wine grapes. *Vinho verde* grape production then would have required a total of 60,800 hectares rather than the 74,000 hectares in production in 1983. Currently, to match the production of the modern wine grape systems, the proportion of white *vinho verde* would have to increase substantially, and the regulation and marketing of high-quality wines would need to be expanded enormously. Such major changes are unlikely, even during the ten-year transition period to full EC membership.

Implications for labor use and migration also can be derived using the hypothetical structures for milk and wine production. If the approximately 50,000 milk producing families who would be displaced by the medium milk structure had six members each, 300,000 people would be affected. Assuming that one-half of these people stayed in the rural areas to provide labor on the larger milk farms, to continue farming, or to retire, migration or off-farm employment would have to support 150,000 people. This number is not excessive in view of previous migrations from the Northwest, but the impact would be concentrated in the coastal zone, where most of the milk is produced. Fortunately, the coastal zone also has a higher concentration of industrial and commercial businesses, which represent a potential source of employment for rural residents, often without the necessity of migration.

When the wine data are analyzed in the same manner, the situation becomes more alarming. A decrease from 212,000 to 30,400 *vinho verde* producers implies over 1 million affected persons (181,600 times 6) and potentially over 500,000 migrants. However, there are several problems with this simple calculation. The structure and technology of the modern wine system are so different from those of the existing systems that it is unlikely that the new system will be adopted widely, at least in the foreseeable future. Also, many of the wine grape farms produce milk, so the adjustment process must be treated jointly for these producers. For example, it would be erroneous to total the number of affected milk and wine producers (50,000 plus 181,600) to obtain an estimate of the number of farmers affected by the hypothetical changes in milk and wine production. Nevertheless, these estimates indicate the maximum number of

affected farms and the additional migration (above that occurring to accommodate current rural population growth) that would result if rapid structural and technical change were to occur in the milk and wine producing areas of the Northwest.

Technical Adjustments

Structural adjustments will no doubt help transform northwestern agriculture and will provide a partial solution to some of the anticipated problems associated with Portugal's entrance into the EC. Technical adjustments, however, will also have to occur. The analyses of the representative farms assume no technical changes during the transition period; therefore, the need and potential for technical change must be discussed separately.

A transition from the small traditional to the small milk system represents important technical changes. The differences in profitability of these two systems verifies one of the strong motivational factors for the historical switch from small traditional to small milk systems. However, the strength of this motivation decreases rapidly with EC membership; the small milk system will go from about a breakeven position in 1986 to losses of 21 and 47 percent of total receipts by 1991 and 1996, respectively. By 1996, the relative losses of the two systems will be about equal (47 percent for small milk systems and 52 percent for small traditional systems). It is unrealistic to expect farmers to switch from one losing system to another.

Yield Improvements

The possibilities for yield improvements on small milk farms to make them profitable appear limited. With no changes in total costs, milk yields would have to increase from 3,400 liters per cow per year to 4,677 liters in 1991 and 6,540 liters in 1996 for the representative small milk farm to break even. Since total costs would certainly increase, these breakeven yields, which are already greater than the yields for the medium milk system, would have to be even higher. It is unlikely that small milk producers will be able to attain these yields; other adjustments will be required.

For the medium milk farm, technical change offers some promise for maintaining private profitability. Under the same assumption of constant total costs, breakeven yields in 1991 and 1996 will be 4,020 and 5,225 liters per cow per year, respectively, compared to 4,000 liters in the original analysis. Attaining the breakeven yield for 1991 is certainly possible, but reaching the 1996 level with constant total costs implies a 23 percent reduction in real per unit costs of milk production and processing. Such a cost reduction is unlikely. A similar situation exists for the

large milk farm, suggesting that in the 1990s simple yield increases cannot be expected to solve the problems confronted by milk producers.

Changes in Crop Mixes

In addition to seeking more profitable technologies, farmers also change crop mixes in response to changes in relative profits. Adjustment to EC rules and regulations will alter the relative prices and profits of the basic commodities produced in the Northwest. Within the representative farms, potatoes will become relatively more profitable during the transition period. Moreover, increasing the proportion of white to red *vinho verde* can result in a higher blend price for wine if the grapes are processed in a cooperative or private winery with good quality control. Knowledge of these possibilities was used to specify hypothetical changes in the crop mixes for four of the six representative farms. No changes were made for the modern wine farm because it maintains high profits throughout the transition period. In addition, no changes were analyzed for the large milk farm because it produces only milk and potatoes, and any realistic changes in crop mix would require substantial modification of the farm, with associated investment costs.

For the small traditional, small milk, and small wine grape farms, the areas devoted to excess corn and beans (the amount not needed for milk production) in the original crop mixes were eliminated and, in the first two cases, were replaced with additional potatoes. As a result, the area in potatoes went from 0.1 to 0.371 hectare for the small traditional farm and from 0.1 to 0.443 hectare for the small milk farm. Grape production on the small wine grape farm was expanded from 0.4 to 0.61 hectare. For all four farms analyzed, the proportion of red to white *vinho verde* was fixed at 60/40 and the grapes were processed by a cooperative winery. The 60/40 proportion is close to the actual production of cooperative wineries in recent years (Mendes 1985, 20). No alterations were made in the milk producing activities of the four farms.

The alternative crop mixes are compared with the original crop mixes in Table 11.3. In all cases, total revenues and returns to land and management are greater for the alternative crop mixes. In two of the cases, the medium milk and small wine grape systems in 1991, returns change from negative to positive as a result of the new crop mix. Also, in 1996 the small wine grape system is close to the breakeven point under the new crop mix. Although improvements in returns of about 50 contos are realized for the small traditional and small milk systems, the alternative crop mixes still exhibit losses, and the 1996 losses are fairly large. Over all, changes in the crop mixes give encouraging results through 1991. If the changes were combined with modest technical improvements in milk production, all four of the representative farms could have positive returns to land and

TABLE 11.3. *Private Costs, Revenues, and Returns for Crop Mixes in Four Representative Whole-Farm Systems in the Northwest, 1991 and 1996 (in Thousands of Escudos per Hectare)*

System and Year	Original Crop Mix[a] Total Costs	Total Revenues	Returns to Land and Management	Alternative Crop Mix Total Costs	Total Revenues	Returns to Land and Management	Change in Returns to Land and Management
Small Traditional							
1991	278	208	−70	371	352	−19	+51
1996	294	193	−101	387	340	−47	+54
Small Milk							
1991	411	339	−72	488	465	−23	+49
1996	433	294	−139	509	424	−85	+54
Medium Milk							
1991	598	596	−2	617	626	9	+11
1996	609	501	−108	628	530	−98	+10
Small Wine Grape							
1991	425	377	−48	514	529	15	+63
1996	441	362	−79	531	517	−14	+65

SOURCE: PES team estimates.
[a]From Table 11.1.

management in 1991. The results clearly indicate the incentives that will motivate some producers to change their cropping systems.

But how realistic are the hypothetical changes in potato and wine production? For the small wine grape farm, which already uses the cooperative winery, expanding the area in grapes and increasing the proportion of white *vinho verde* varieties is reasonable and probably will occur in areas whose soil and climate are favorable for quality *vinho verde* production. The presence of a well-managed cooperative or a good private winery is an additional prerequisite for supporting the expansion of *vinho verde* production. Moreover, such a winery will need a strong marketing capability, including the ability to develop and maintain export markets. Expansion of grape production on the small wine grape farms will take time because farmers will have to invest in new *ramadas* or other support structures and wait for the new vines to reach full production (seven to ten years). However, this alternative seems much more realistic than a major shift to the type of system represented by the modern wine grape farm.

Although the change in returns is not large, medium milk farms could also change their wine grape systems as specified in the alternative crop mix. To do so would require abandoning home wine making, joining a cooperative winery (or selling the grapes to a private winery), and increasing the proportion of white *vinho verde* varieties. In the coastal areas where it is difficult to produce quality *vinho verde*, some medium milk producers might expand potato production rather than attempt to improve grape production.

For the small traditional and the small milk farms, the possibilities of changing the wine activities to correspond to the alternative crop mixes appear more limited. The main obstacle involves the elimination of home wine making. Currently, 38 percent of the *vinho verde* is produced and consumed on farms that are similar to the small traditional and small milk farms. Given the strong tradition for producing homemade wine, the preference for red *vinho verde* in the rural areas of the Northwest, and the equal pricing of common homemade red and white *vinho verde*, changes on these farms will be much slower than on the more specialized, small wine grape farms in the better-producing zones.

The possibilities of expanding potato production on the small traditional and small milk farms appear more likely than the hypothetical changes in wine production for these farms. Increasing potato production does mean a new marketing activity for these farms, since most of the potatoes produced on 0.1 hectare are for home consumption. However, the small traditional and small milk farms have demonstrated their willingness to produce for the market, and expanding potato production does not interfere with home consumption. The need for a stable market is an obvious complement to expanded production by small-scale producers. Also, the disease problems of planting a relatively larger portion of the farm's cultivated area to potatoes need to be investigated carefully. For example, soil fumigation might be required.

The likelihood of crop mix changes is thus high. The farms on hillsides with appropriate soils, acceptable slope, correct exposure to solar radiation, and minimal frost potential will tend to specialize in wine grape production and to increase the proportion of white *vinho verde* varieties. The coastal zone, where the soils are lighter, will probably experience an increase in potato and other vegetable production. Proximity to the large Porto urban market and the improving road system to the south give an extra advantage to vegetable producers in the coastal zone. Crop mix changes will occur along with the other technical and structural changes. Given the historical experiences of the Northwest, it appears that changes in crop mixes and technology will occur more rapidly than changes in farm structure. The strong social ties to land and the high incidence of part-time farming are the main reasons for expecting slow adjustments in farm size.

The Adjustment Process

The discussion up to this point has proceeded as if all the farms of a particular type (for example, small milk) are homogeneous and that all the farmers and their families have equal opportunities and desires for adjustment as economic conditions change—which is clearly not the case. The

desire for change, the ability to adjust, and the rate of adjustment depend primarily on the economic and personal characteristics of the farm families that currently operate farms in the Northwest. In the long run, new farmers and owners of resources will emerge, but adjustment must begin with the existing owners and managers.

Innovations in milk production in the Northwest generally have spread from the leading larger farmers in each parish to the smaller farmers, who ultimately owned one to three milk cows. The difficult task in contemplating the response of the agricultural sector to declining profits is to identify which farm families will contract their operations and which will expand them and seek new opportunities. Will the process reverse itself, with the smaller farms adjusting first, or will it follow the expansion pattern of the larger, more modern farms leading the way? In terms of relative economic impact, the transition to EC policies falls harder on the smaller producers. Losses as a percent of total receipts in 1996 are estimated at 52 and 47 percent for the small traditional and small milk farms, respectively, compared to 22 and 28 percent for the medium and large milk farms, respectively.

In strictly economic terms, the small farms would be expected to adjust first; many small farm families would leave agriculture because of the extreme economic pressures. However, many of these farms are operated by part-time farmers who have nonfarm sources of income, and they are unlikely in the short run to sell their land. Instead, they will adjust crop mixes and technologies to the extent possible given their limited land areas. Many of these farms are operated by women and children because the husbands work at local nonfarm jobs or as migrants outside Portugal. In the longer run, as social and economic conditions change, the relative importance of small farms as producers of marketed crops is likely to decline. The children of these households are better-educated than their parents, and many of them will follow the paths of their fathers and obtain off-farm employment. Some young people will migrate, and others will seek local jobs in industry and business, but only a few will become farmers.

Retirees who farm part time are another important and expanding group of rural residents. The desire for a rural retirement life-style seems very strong among the northwestern Portuguese. Many of the retirees are emigrants who have returned to their home communities and built new homes or remodeled old ones and who farm part time for home consumption and extra income. It appears that this group will continue to grow as the number of retirees increases. It is likely that retirees will occupy many of the small farms that are no longer economical units for full-time farming. Their contribution to marketed output will be minimal.

In contrast to the retirees, another group, consisting primarily of young men and some young women, will follow the traditional pattern of the Northwest and seek to emigrate. In addition to the poor conditions of the local agricultural economy, their decision to emigrate will be influenced strongly by general economic conditions and job opportunities in Portugal and the rest of Europe, Brazil, and North America. If the European and other labor-short economies return to the higher growth rates of the 1960s and early 1970s, emigration will probably increase. Emigration to other EC countries will be facilitated by Portugal's membership in the EC and the consequent freer movement of labor, but it will be limited by the higher costs of hiring Portuguese workers, who will receive full social benefits in the host countries.

What remains is a small group of commercial farmers and a large group of small, traditional farmers who are dependent mainly on farming for their incomes. The better commercial farmers will continue to innovate, and many will manage to make profits. They will change their crop mixes, improve their technologies, seek new products, increase their farm sizes, and improve their already superior management skills. In contrast to the smaller farmers, most of the managers will be men, and what off-farm income they have will come from the earnings of wives and children or other relatives. Although commercial farmers will operate in the best locations, use modern technologies, and produce one or two commodities for the market, they will nevertheless feel the pressure of European competition.

The small, traditional farmers who are dependent mainly on farming for their incomes face the most difficult circumstances. Many of them, especially the elderly and single women, will be forced to stay in farming and take lower returns on their labor. Their poverty will increase, but their options will be limited. They are traditional farmers today because they were not able to take advantage of previous opportunities to become small milk producers, to increase specialization in wine production, or to migrate. A small number of them will be able to advance and become commercial farmers; a large number will remain trapped in marginal agriculture; and, depending on general economic conditions, a significant number of the young family members may migrate. This group has been largely ignored and unaffected by previous agricultural policies.

If these patterns occur, further consolidation of land will take place through transfer of ownership or rental, as some commercial farmers seek to expand their operations. However, unless the profitability situation changes in ways not currently foreseen, consolidation and expansion are likely to occur at a slow pace and only in the areas with the most favorable conditions for agriculture. The flat valley areas, the best wine producing

zones, and the coastal lands will be likely to experience most of the consolidation that occurs.

Policy Implications and Conclusions

The Portuguese policy responses to the problems of the Northwest have relied primarily on technical solutions. The current programs for modernization of the milk industry in the Beira Litoral and the Entre Douro e Minho seek to create a few milk farms similar to the medium and large representative milk farms in this study. For example, the objectives of the Beira Litoral program are to transform the milk sector in fifteen years from 30,000 farms to 5,625 farms and to increase milk production by 32 percent while maintaining the same number of cows and reducing the cultivated area by one-third (MACP-BL 1983, 22). A similar strategy is proposed for the Entre Douro e Minho region (MAP-EDM 1981).

One of the projects for the modernization of *vinho verde* production in the Vale do Lima calls for reducing the number of producers from 37,443 to 12,355 (MACP-EDM 1982, 220). Only 1,125 producers would benefit directly from the project, and they would control 3,000 of the 4,700 hectares designated for *vinho verde* production in the valley. The remaining 11,230 producers would utilize 1,700 hectares for the production of wine for home consumption.

Although these programs appear to be technologically sound for the project beneficiaries, they ignore the farm families that would be displaced by the creation of larger farms. The displaced families are relegated implicitly to the category of social problems that are not considered to be the responsibility of the Ministry of Agriculture and the Regional Agricultural Services. Their problems are to be solved by other ministries and agencies.

In order to coordinate the activities of the various ministries that must play a part in the transformation of agriculture in the Northwest, the Regional Coordinating Commissions will have to have a strong role. However, they face the obvious problems of trying to integrate the activities of several ministries that want to run their own shows, take full credit for all improvements, and take no responsibility for the failures. It is beyond the scope of this book to prescribe organizational structures, duties, and responsibilities, but it is clear that the adjustment problems of agriculture in the Northwest require a coordinated, multipronged effort involving more than the Ministry of Agriculture.

Given the current policy directions and outlook for the future of the rural Northwest, what additional policy options should the Portuguese government consider? Macroeconomic policies that result in economic growth and stable prices are as important as specific sectoral and com-

modity policies. A good macroeconomic environment will provide increasing employment opportunities for migrants from the Northwest. Stable prices will protect retirement benefits, which normally are fixed, from the eroding effects of inflation. A growing economy could also provide the additional needed government revenues to alleviate the poverty problems of those trapped in unprofitable agriculture.

Sectoral and commodity policies will be required to facilitate the expected adjustments in agriculture. Research and extension programs will continue to be needed to address the problems of farmers trying to modernize and increase the size of their operations. These programs should focus on small farmers who, largely because of their human capital, have the potential to expand. Small-scale grape production for quality wine making is an example. The transition from traditional grape production and wine making to the production of quality wine can be a gradual process of substituting new varieties for the traditional varieties and expanding and improving private and cooperative wineries. Single period conversion of a farmer's traditional *ramada* grape system is neither necessary nor likely since it would create major cash-flow difficulties. This statement is also true for changes in the milk systems.

Programs of technical change that fit small farmers' means and objectives need to be designed and implemented. Medium and large farmers, as in the past, will be able to take advantage of any new, profitable innovations that are introduced. But public investments need to be oriented so as to include small farmers in the process. This critical task is made even more difficult by the limitations of certain EC structural aids that exclude small farms.

New commodity systems need to be evaluated. The changing market structure associated with EC accession could provide opportunities for the expansion of high-valued speciality crops such as fresh or processed fruits and vegetables. Agronomic and economic research is needed to determine the feasibility of new crops. Research and programs to reduce the production and marketing risks associated with potatoes would further stimulate the production of this profitable crop.

Structural adjustment policies and programs that facilitate land consolidation are also essential. These programs need not require large government expenditures for expropriation and consolidation; rather, they can include changes in rental laws and ownership transfers that aid the spontaneous process of consolidation. Where funds for structural adjustments are required, Portugal needs to prepare sound projects for EC financing. Infrastructure investments in education, roads, transportation, and marketing systems will help the adjustment process. Investments in human capital through general education, job training, and extension programs are extremely important given the low levels of literacy and education in

the Northwest and the consequent limitations on labor's movement out of the declining agricultural sector.

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PART FOUR

Policies for Change

12. Future Commodity Policies

by Timothy Josling and Stefan Tangermann

The rapid changes in profitability of the farming systems discussed in the previous two parts of this book pose a major challenge for Portuguese agricultural policy. The government will be under pressure to resist change where private profits are declining; it will be called on to speed up change toward newly profitable activities; it will be expected to adapt to EC regulatory provisions that often are imperfectly suited to Portuguese conditions; and it will be under continual scrutiny within Portugal because it is a visible manifestation of the country's joining Europe.

This chapter discusses the commodity policy options available to Portugal during the next decade. The first section of the chapter deals with policy for the transition period, including both price-level and marketing-system changes. This section is followed by discussions of the possible impacts on commodity systems of CAP changes associated with alternative future developments and of Portugal's interest in CAP reform.

Portuguese Transition Policy

Much of the scope for policy choice during the transition period is circumscribed by agreement, as discussed in chapter 3. In theory, Portugal can speed up the harmonization of prices and legislation, but it cannot slow down the process. In practice, there might be some scope for delaying certain adjustments by claiming hardship if changes are especially adverse. However, this effort would entail the expenditure of bargaining capital within the EC and would therefore have a political cost. Transition policy thus involves primarily the identification and acceleration of beneficial changes. Little scope exists to grant price increases to the commodities whose prices are generally below EC levels—livestock products such as beef, lamb, poultry, pork, and butter and sunflowers, tomatoes, rice, sugar, and wheat flour. Some flexibility is available, however, to accelerate or delay the price decline in products for which Portuguese prices are higher than EC levels, such as wheat, coarse grains, skim milk, cheese, oranges, and wine.

Transition Prices

The pressures to modify transition arrangements are indicated in a summary of the results for commodities and regions described in the previous chapters. Table 12.1 shows the farm-level private profits for 1983, for the year of entry (1986), the start of the second phase of the transition for most commodities (1991), and the first year of full integration of prices and policies (1996). Of the thirty-six systems shown in the table, eight are unprofitable at the farm level in the year of accession (if farmers put a full market valuation on their own labor and on that of their families). By the end of the first phase, three southern systems—wheat on poor soils and both medium and high technologies for sheep—will lose their private profitability in the absence of cost-effective technical change. Three northern systems—medium milk, large milk, and hybrid corn—also will move to negative profitability. For these systems and possibly others with low profitability, pressure will be brought to bear on Portuguese policymakers to set prices as high as possible.

Several considerations will determine the extent to which it is desirable to give additional support to Portuguese agriculture during the transition period. Prices could be set at the higher end of the range of flexibility provided for by the transition arrangements (or possibly even modified in renegotiations). But higher Portuguese prices will have a resource cost in the first phase, as domestic production is substituted for cheaper foreign sources, and also an economic cost in the second phase because levy receipts paid to the EC will be larger. The loss in the first phase will be offset in part by a budgetary gain if imports placed under the levy system attract revenue accruing to Portugal.

Speeding up price declines would avoid the additional budgetary cost in the second phase and would improve resource allocation. However, significant individual costs will be borne by producers in areas where price reductions will occur. Four groups of producers in particular face the prospect of rapid declines in real prices between 1986 and 1991, as shown in Table 12.2. During the first five-year phase of the transition, wheat and flour prices are projected to fall by 16 percent, milk prices by 23 percent, and sheep prices by 12 percent. For these commodities, the transition will not be over by the end of the first phase; real prices will continue to decline thereafter. Since some of the systems in which these commodities are produced have negative private profitability, pressures for higher Portuguese prices during the transition period will concentrate on these products.

The government will face a dilemma in these instances. Economic and financial cost considerations would speak for low Portuguese transition prices, but private profitability and farm income aspects call for higher

prices. It appears likely that ultimately the pace of transition will be governed by the impact on farm profitability. But higher prices during the transition period merely postpone the adjustments. Since Portugal eventually has to adjust to EC prices, the issue essentially is to choose the appropriate time schedule of price harmonization. High prices throughout the transition period might be unpopular even from a farm perspective since they would have to be followed by rapid declines in real prices at the end of the transition phase.

Marketing Changes

In addition to accelerating price changes, Portugal can speed up modifications to the marketing system for farm products—the rationale for the first stage of the transition. Changes can be grouped under five headings: (1) elimination of the exclusive importing rights of the public agencies; (2) introduction of competition among private firms and among private and state enterprises in the domestic market; (3) modification of public agencies to allow them to function as intervention agents and perform other regulatory functions under EC rules; (4) development of cooperative marketing organizations if they can play an integral part in implementing EC regulations or can be beneficial in improving farmers' access to markets; and (5) improvement of the market infrastructure, including information channels, grading, quality control, wholesale markets, auction markets, price competition, and other aspects of efficient commercial structures.

The most dramatic of these changes is the privatization of the grain trade. Major changes for EPAC are mandated by the Treaty of Accession, but they have not yet been implemented fully. In grain importing, the treaty requires a sliding scale of participation by the private trade, which is expected to reach 100 percent in 1990. A levy system is being put into place for private firms importing grain to allow a switch to the full EC system in 1991. The treaty also provides that 15 percent of Portugal's imported grain must come from other EC members—a provision that has sparked a controversy between the EC and the United States. EPAC's role in the first phase includes ensuring that the obligation to buy from the EC is fulfilled. The increased role of the private trade will result in a wider range of marketing opportunities, more services, more price differentiation among qualities, new seasonal price patterns, and a regional dispersal of activities.

In the mixed-feed industry, feed manufacturers will have access to world markets for inputs, subject to CAP and EC border policies. There will be a shift in demand for feed ingredients as relative prices change and new inputs become available. The feed industry expects to be a major impetus for change in the domestic marketing of grains for feed and

TABLE 12.1. *Projected Farm-Level Private Profitability of Selected Agricultural Systems in Four Regions, 1983–96 (in Thousand Escudos)*

Region and System[a]	Private Profit per Metric Ton of Final Product				Private Profit per Hectare			
	1983	1986	1991	1996	1983	1986	1991	1996
Alentejo								
Wheat, good soil	11.51	8.73	4.85	0.56	23.02	17.46	9.70	1.12
Wheat, poor soil	5.62	2.49	−1.53	−5.97	7.59	3.36	−2.07	−8.06
Flour, *ramas* mill	−0.12	1.53	1.25	4.13	—	—	—	—
Flour, *espoada*	1.31	3.09	2.94	6.05	—	—	—	—
Sheep, medium technology	90.14	28.77	−28.03	−65.93	214.08	68.33	−66.57	−156.58
Sheep, high technology	134.96	49.24	−2.75	−35.39	462.24	168.65	−9.42	−121.21
Beef, pasture-fed	79.10	−30.60	−46.70	−28.20	2.33	−0.90	−1.38	−0.83
Beef, feedlot	35.90	−47.49	−56.38	−33.39	459.13	−607.35	−721.04	−427.02
Cow-calf operation	89.73	−1.64	−13.45	−7.97	17.16	−0.31	−2.57	−1.52
Sunflowers, dryland	5.63	7.88	7.09	5.17	2.82	3.94	3.55	2.59
Rice, Sado Valley	12.98	17.24	14.15	16.72	64.90	86.20	70.75	83.60
Tomatoes for processing	13.33	9.51	16.57	14.30	79.31	56.58	98.59	85.08
Ribatejo								
Wheat, Vale do Tejo	15.06	13.97	10.19	6.00	60.24	55.88	40.76	24.00
Corn, Vale do Tejo	12.50	12.68	8.39	7.87	87.50	88.76	58.73	55.09
Rice, Sorraia Valley	12.98	17.24	14.15	16.72	64.90	86.20	70.75	83.60
Sunflower, irrigated	18.25	27.64	28.19	29.07	31.94	48.37	49.33	50.87
Wine, white	1.55	1.88	1.06	0.18	12.05	14.62	8.24	1.40
Tomatoes, owned	7.17	3.52	10.25	7.62	48.76	23.94	69.70	51.82
Tomatoes, *seareiro*	11.40	7.73	14.70	12.34	87.21	59.13	112.46	94.40
Melon, *seareiro*	7.98	8.09	7.67	7.22	139.65	141.58	134.23	126.35
Sugar, domestic beet	21.61	11.11	7.55	5.44	140.47	72.22	49.08	35.36
Broilers, integrated	26.49	−60.12	−68.42	−45.74	20.40	−46.29	−52.68	−35.22

Azores								
Cheese, edam	89.98	94.92	67.69	61.00	35.99	37.97	27.08	24.40
Milk powder, butter	89.98	113.29	91.61	79.76	35.99	45.32	36.64	31.90
Northwest								
Milk, traditional	−227.80	−184.90	−285.80	−367.80	−81.35	−66.03	−102.07	−131.33
Milk, small	−33.90	−15.90	−85.10	−135.20	−36.59	−17.16	−91.85	−145.93
Milk, medium	41.13	30.49	−19.33	−51.25	75.93	56.29	−35.69	−94.61
Milk, large	30.62	13.75	−33.38	−63.19	56.53	25.38	−61.62	−116.66
Corn, regional varieties	−0.18	−1.10	−3.79	−10.60	−0.54	−3.30	−11.37	−31.80
Corn, hybrid varieties	2.40	0.82	−1.82	−8.57	9.60	3.28	−7.28	−34.28
Potatoes, traditional	3.21	2.90	2.52	2.10	48.15	43.50	37.80	31.50
Potatoes, medium	3.07	2.88	2.66	2.42	61.40	57.60	53.20	48.40
Potatoes, large	3.94	3.72	3.50	3.26	78.80	74.40	70.00	65.20
Wine, traditional	−5.26	−5.76	−5.46	−5.52	−43.40	−47.52	−45.05	−45.54
Wine, *ramada*	3.36	4.28	3.34	2.31	27.73	35.31	27.56	19.06
Wine, *cordão*	32.51	32.63	32.09	31.51	243.83	244.73	240.68	236.33

SOURCE: PES team estimates.
— = not applicable.
[a]The systems are described in chapters 5 through 8.

TABLE 12.2. *Projected Price Changes Facing Selected Agricultural Systems in Four Regions, 1983–96*

Region and System	Farm-Level Price for Main Product (in 1983 Escudos per Kilogram) 1983	1986	1991	1996	Percent Change over Period 1983–86	1986–91	1991–96
Alentejo							
Wheat, good soil	23.00	22.56	18.95	14.96	−2	−16	−21
Wheat, poor soil	23.00	22.56	18.95	14.96	−2	−16	−21
Flour, *ramas* mill	20.79	28.39	22.85	22.77	37	−20	0
Flour, *espoada*	22.00	30.38	24.46	24.38	38	−20	0
Sheep, medium technology	360.00	333.13	291.60	270.38	−7	−12	−7
Sheep, high technology	360.00	333.13	291.60	270.38	−7	−12	−7
Beef, pasture-fed	330.89	258.76	248.06	268.99	−22	−4	8
Beef, feedlot	330.89	258.76	248.06	268.99	−22	−4	8
Cow-calf operation	186.67	145.98	139.94	151.75	−22	−4	8
Sunflowers, dryland	35.00	38.74	38.69	37.57	11	0	−3
Rice, Sado Valley	28.44	33.19	30.48	33.45	17	−8	10
Tomatoes for processing	30.59	27.36	35.41	34.21	−11	29	−3
Ribatejo							
Wheat, Vale do Tejo	23.00	22.56	18.46	14.96	−2	−18	−19
Corn, Vale do Tejo	23.00	21.44	20.58	15.77	−7	−4	−23
Rice, Sorraia Valley	41.22	48.11	44.17	48.48	17	−8	10
Sunflowers, irrigated	35.00	38.74	38.69	37.57	11	0	−3
Wine, white	20.00	20.27	20.27	20.27	1	0	0
Tomatoes, owned	30.59	27.36	35.41	34.21	−11	29	−3
Tomatoes, *seareiro*	30.59	27.36	35.41	34.21	−11	29	−3
Melon, *seareiro*	17.30	17.30	17.30	17.30	0	0	0
Sugar, domestic beet	34.46	24.48	21.43	19.87	−29	−12	−7
Broilers, integrated	156.05	148.76	139.03	137.07	−5	−7	−1

Azores							
Cheese, edam	188.10	218.55	196.03	186.27	16	−10	−5
Milk powder, butter	188.10	218.55	196.03	186.27	16	−10	−5
Northwest							
Milk, traditional	226.50	249.20	192.50	158.80	10	−23	−18
Milk, small	216.85	238.70	184.40	152.10	10	−23	−18
Milk, medium	216.85	238.66	184.35	152.09	10	−23	−17
Milk, large	216.85	238.66	184.35	152.09	10	−23	−17
Corn, regional varieties	23.00	21.44	20.58	15.77	−7	−4	−23
Corn, hybrid varieties	23.00	21.44	20.58	15.77	−7	−4	−23
Potatoes, traditional	15.00	15.00	15.00	15.00	0	0	0
Potatoes, medium	15.00	15.00	15.00	15.00	0	0	0
Potatoes, large	15.00	15.00	15.00	15.00	0	0	0
Wine, traditional	18.15	16.75	17.96	18.90	−8	7	5
Wine, *ramada*	27.74	27.74	27.74	27.74	0	0	0
Wine, *cordão*	52.22	52.22	52.22	52.22	0	0	0

SOURCE: PES team estimates.

oilseeds. Seed imports already have been liberalized, removing the common complaint of farmers that the state agencies did not purchase appropriate qualities and varieties of seed.

The treaty calls for the elimination of the JNPP, the JNV, and the JNF—the marketing boards for animal products, vine products, and fruits, respectively—at the end of the first transition stage, together with the progressive liberalization of domestic trade, imports, and exports in the commodities covered by these boards. The objective, as discussed in chapter 3, is to ensure free competition in and free access to the Portuguese market. Informational and statistical functions presently handled by the three boards will be moved elsewhere. An intervention agency is being set up to handle the programs that offer intervention buying and storage subsidies under the CAP rules.

Changes in the livestock sector could be as substantial as those in the grain area. The JNPP has extensive power in controlling meat and dairy processing and marketing. Most beef and sheep slaughtering has been undertaken at JNPP-owned stations, in facilities taken over from the municipalities after the Revolution. Allowing private enterprises to slaughter beef and sheep is already part of a plan to reorganize the slaughtering industry, but so far only one private firm is in operation. When the meat trade is liberalized, there is likely to be pressure for industrial slaughterhouses that do at least the primary butchering. In the milk market, the cooperatives might eventually lose their exclusive collection rights. Private firms then could enter and take over the most profitable collection runs. This possibility seems unlikely at present, given the importance of cooperatives in Portuguese milk marketing and the general predilection of EC officials for this type of marketing. A much more serious problem seems to be competition from imported cheese. Unless domestic cheese can be marketed competitively with imports, the domestic milk price will weaken. Cheese normally is not supported by domestic market intervention in the EC (the only exception is Italy). A weak cheese price could seriously reduce profits to dairy producers in the Northwest.

Market Balance Shifts

Individual commodity markets will be influenced by the price and marketing trends just discussed. Greater private profitability will tend to increase the output of particular products, although no attempts have been made in this study to quantify such changes. Price increases could also dampen demand for products and shift consumption to substitute products. This dual shift in production and consumption will, of course, show up for most commodities as a change in trade volume.

Some indication of the strength of production shifts can be seen from the change in projected private profits per hectare. Table 12.1 brings

together the results discussed in the chapters on specific regions and shows projected 1991 and 1996 private profits at the farm level. The more land-intensive field crops (tomatoes and melons), modern wine, and rice appear to be ready for expansion in production levels, whereas the commodities for which a substantial price decline is forecast—particularly wheat and milk—could decline in production. Wheat in the Alentejo on good soils (A and B classes), wheat and corn in the Ribatejo, and milk in the Azores, however, remain profitable despite real price decreases. Traditional wine, by contrast, will likely contract in production unless there is a significant introduction of marketing and quality control.

The products experiencing price declines will become more attractive to consumers relative to close substitutes with higher prices. For example, skim milk powder could be used in animal feed rations because of its lower price and because of a consumption subsidy under EC regulations. By contrast, price increases for sunflowers, wheat flour, butter, rice, and tomato paste could cut into consumption. One would expect, for example, to see demand shift toward other oilseeds and away from sunflowers and toward oleomargarine and away from butter. Because much of the reduction in producer prices of wheat and corn will not show up in lower market prices—which are tied to the EPAC selling prices—cereal consumption will not necessarily increase. Income growth in the economy is likely, over time, to continue the shift in demand away from starchy foods and toward livestock products. Production incentives for these commodities do not seem to promise strong output growth, which indicates the possibility of substantially increased imports.

CAP Developments

The projected CAP prices in this study are assumed to follow a moderate trend, one that avoids real price increases in the major EC countries. This trend calls for price increases of about 1 to 3 percent each year in ECU terms, depending on the commodity; the projected percentage increases translate into significant real price declines in member countries for most commodities during the projected period. The actual price paths for particular products will depend on both market pressures and political interests.

Alternative Price Developments

Future cereal prices in the EC will depend on both internal and external influences on the EC cereal market. As a result of generous support for cereal growing and rapid technical change, the EC now has become a major exporter of wheat and barley and a more modest importer of corn. Consequently, the cost of the cereal policy has become an issue in the

reform of the CAP. In the past, the Commission often has declared its intention to move EC cereal prices toward those of the United States, so far without the agreement of the Council of Ministers. Although the downward pressure on cereal prices in the EC was eased by the strength of the US dollar in the early 1980s, the depreciation of the dollar in 1985–86 has reversed that influence. EC domestic prices were broadly within the range of US target prices in 1984, even though the EC threshold price was still above world price levels.

The EC Council has recently acted on a proposal by the Commission to freeze cereal prices expressed in ECUs and to introduce a coresponsibility levy of 3 percent on grain producers for 1986–87, and it has discussed the introduction of restrictions on the import of cereal substitutes. The EC will have to pay more to finance growing quantities of wheat and coarse grain exports under more normal world market prices. As the dollar continues to weaken against the ECU, there will likely be either an attempt at quantitative control or a more consistent series of real price reductions. Any such development would reinforce the downward pressure on profitability in the Portuguese cereal sector.

The dairy sector will remain a problem area for the CAP for years to come. The EC on several occasions has tried to rein in dairy production in the member states—through herd conversion subsidies, producer levies, guarantee thresholds, and, most recently, quotas. But the EC Council seems to lack the political will to apply these restraining instruments effectively. Quotas were instituted because the existing guarantee threshold mechanism would have called for a significant price cut. Quotas by farm, with a heavy penalty for overproduction, have been replaced unofficially by national quotas—with few penalties as yet being assessed on individuals—as a result of the Council's recent decisions. If dairy prices are increased to compensate farmers for the losses from the milk quotas, the problems of the dairy surplus will remain. By the time the Portuguese dairy industry comes under the full force of the CAP, some action probably will have been taken to reduce milk profitability or to strengthen the efficiency of quotas. This action will further increase pressures on Portuguese profitability in this sector.

Meat production, once assumed to be required at increasing levels to meet growing consumer demand, also has run into surplus problems in the EC. Apart from lamb, for which imports persist under special arrangements with New Zealand, and some beef for the restaurant trade, the EC does not import significant amounts of red meat. Prices are supported by intervention buying and private storage subsidies, which are becoming increasingly burdensome to the budget. Therefore, livestock prices will be under pressure in the next few years. For poultry and pork, the domestic price is not rigidly supported. Since foreign supplies essen-

tially are kept out of the EC market through a prohibitively high import levy, the EC market is in domestic supply-demand equilibrium. This equilibrium means that EC prices are determined largely by production costs—in particular, feed prices. If cereal prices were to be brought more in line with world market prices, prices for grain-fed animal products would tend to fall. Because there is no regular domestic intervention buying for poultry and pork, there is no effective price floor in these markets.

For several high-value field and orchard commodities—tomatoes, citrus, wine, and sugar—the price prospects in the EC are influenced also by immediate or impending surpluses. Enlargement of the EC to include Spain, in particular, adds greatly to the level of self-sufficiency of many of these crops. Within the EC, there has been tension between the producer countries (France, Italy, and Greece) and the payer countries (Germany and the United Kingdom) about the extent to which field crops and horticultural products should be supported. Arguments about the vital nature of grain supplies and the need to support the income of small dairy farms do not translate easily to modern, market-oriented, capital-intensive, field-scale vegetable growing. However, traditional farming in southern Europe, based on wine, olive oil, and citrus culture, needs more support than is needed by modern cereal and large-scale dairy enterprises. Ultimately, political pressures within the EC will determine whether southern crops are left largely to the market or whether some of the budgetary support given to northern products is redistributed to these crops. The introduction of guarantee thresholds for tomatoes, olive oil, and wine indicates that support prices might be held back for some of these commodities. But the acknowledgment of the fact that EC enlargement will make budgetary demands on the CAP suggests that a rigorous implementation of cost containment in these commodities is not seen as likely to occur.

The implications of these broad trends in CAP prices for various parts of Portuguese agriculture can be judged from the projected profitability results given earlier. The system profits are influenced directly by changes in the prices of the major output. The dichotomy between the profitable Ribatejo and Azorean systems and the less secure farming activities in the Alentejo and the Northwest is clear. With the exception of broilers, all the Ribatejo systems and both dairy enterprises in the Azores would be profitable with prices lower than those projected here. The same is true of the Alentejo sunflower, rice, and tomato production, as well as the production of wheat on good soils. By contrast, the livestock activities in the South and the milk and corn systems in the North would require substantially higher prices to achieve or maintain profitability.

The chance of CAP prices rising enough to make these farming systems

profitable varies by product and system. It seems most unlikely that wheat prices will be far enough above their projected levels in 1996 to rescue the profitability of poor-soil wheat production in the Alentejo. But for Alentejo livestock farming, firmer prices than those projected here could make a crucial difference. The northwestern milk systems also are unlikely to be made profitable by CAP price increases, unless the control of production by quotas in the EC proves so successful that all price restraints on this commodity are abandoned.

Macroeconomic Influences on EC Prices

Each commodity, or group of commodities, faces individual problems that influence the trend of policy and market prices. But macroeconomic conditions affect all commodities and could be equally influential. The price projections used in this book have rested on stable economic conditions—a continuation of recent low inflation rates, real exchange rates remaining unchanged, and world prices remaining constant in real (1983) dollars. In the past decade, however, real exchange rates and real interest rates have become unstable, being pulled off course in part by monetary instability. The economies of the OECD countries have been drawn together into a much closer set of interrelated markets, speeding the transmission of shocks through integrated commodity and capital markets. Until macroeconomic policy catches up with the new reality of interdependence, individual countries will continue to receive external sources of instability to add to domestic economic concerns.

Although it makes little sense to try to isolate the impact of each separate macroeconomic influence on future agricultural prices, it is useful to categorize forces into those that tend to increase or to decrease such prices. One would expect CAP prices to rise faster under the following conditions: renewed strength of the dollar, implying higher world prices (in ECUs) and hence a smaller gap between EC and US levels; sudden shortages in international commodity markets, pushing commodity prices above their declining real trends; renewed growth in Europe, bringing some recovery of demand, more revenue in the EC budget, and higher income objectives for agriculture; and more instability in monetary variables, causing sharper exchange-rate variability, more potential for the introduction of new agricultural border taxes or subsidies on trade among EC countries, and more pressure to remove the taxes and subsidies by price increases.

The higher CAP prices would translate into higher Portuguese prices with constant real exchange rates between the escudo and the ECU. If, however, the escudo were to lose ground (relative to inflation differentials), the real price of agricultural products in Portugal would increase (or decrease less). Any increase in the flow of capital out of Portugal or any

weakening of Portugal's international competitiveness could lead to a real depreciation of the escudo. Through frequent changes in the green escudo rate, Portugal could also avoid price levels lower than those in the other EC countries.

A contrary set of influences can be expected to contribute to price trends lower than those projected in this book. The trends include a weakening of the dollar, causing world market prices to be much lower in ECUs; surplus conditions in international agricultural markets, leading to either unilateral or multilateral attempts to reduce the production incentives in national programs; and slow growth in the EC, implying continued shortages of funds, pressure for the use of the EC budget for structural adaptation outside agriculture, and growing concern about intermember transfers of funds.

Lower CAP price trends also can be reinforced by more specific Portuguese conditions. A real appreciation of the escudo relative to the ECU (that is, a depreciation slower than inflation differentials) will lower CAP prices to Portuguese farmers. This price decrease could occur as a result of inadequate depreciation of the escudo, a rush of capital into the country (or a reduction in capital flight), or a tightening of exchange controls in an effort to cut down effective demand for foreign exchange. A policy of infrequent changes in the green escudo rate—to collect subsidies from the EC on imported agricultural commodities—also would result in lower escudo prices.

CAP Prices and the Portuguese Interest

If high domestic prices make more of Portuguese agriculture competitive, should agricultural policy be geared to securing high prices whenever possible? Is it in the Portuguese interest to press for higher CAP prices? As indicated in chapter 3, one of the major implications of joining the EC is that Portugal will be faced with efficiency prices at the level of the EC's internal prices. Levies on lower-priced, third-country imports accrue to the EC, and export subsidies are paid from the EC's funds. The actual world price no longer is of direct relevance for the CAP commodities covered by levies and restrictions on trade. The new efficiency price, the CAP price level, can be influenced by green-rate policy and participation in common decisions in the EC.

There could be pressures in Portugal to hold down the price levels of all traded goods in order to avoid depreciation of the currency. However, rural employment prospects might improve with a lower-valued escudo, which might lead to higher farm prices, more emigrant remittances, and a firmer demand for off-farm work. But it seems unlikely that macroeconomic policy will be dominated by agricultural concerns.

In this context, green-rate policy becomes significant. Rapid depreciation of the escudo gives Portugal the flexibility to have lower agricultural import prices, since the green rate does not have to be depreciated in parallel with the market rate. Whether this flexibility is used is a matter of balancing agricultural and consumer interests. In this decision, economic and financial costs have to be considered. A rapid depreciation of the green rate avoids exchange-rate taxes on farmers but also prevents transfers favoring the consumer and the government budget. Accordingly, government departments will have different views on the appropriate green-rate policy. A policy of moving the green rate somewhat below but parallel to the market rate might be a politically viable compromise.

It would be misleading to emphasize the role of Portugal, as one of twelve EC countries, in shaping EC price and policy decisions. Nevertheless, a consistent and coherent strategy could bring rewards. A choice exists on whether to use a strategy of obstruction (in the hope that, as a small country, Portugal will have its interests supported by other countries anxious for agreement) or cooperation (in the expectation of gaining credit for assisting the decisionmaking). Portugal has a strong economic interest in arguing for moderation in CAP pricing even if that moderation causes some parts of domestic agriculture to suffer declines in earnings. High CAP prices entail high import costs for Portugal's main agricultural products.

But of equal importance is that the CAP generates friction within the EC, spends the lion's share of the EC budget, threatens trans-Atlantic trade relationships, and absorbs the energies of a large part of the EC bureaucracy. Sensible reform of the CAP would bring considerable benefits to the EC in its workings and in its international relations. As an open economy, Portugal has a strong interest in international economic developments, and as the lowest-income member of the EC, the country might expect to gain if the EC budget were gradually removed from the stranglehold of the CAP. From a purely sectoral and domestic point of view, if CAP prices are higher than what Portugal is striving for, Portugal has the option of reducing them nationally by delaying the depreciation of the green escudo. However, it is in the Portuguese interest to reach a given domestic farm price level with low CAP prices rather than with high CAP prices and compensating movements in its green rate.

One qualification needs to be made to the proposition that CAP prices become efficiency prices to Portugal. If an explicit arrangement limiting the net Portuguese contribution to (or establishing minimum net receipts from) the EC budget were to develop, the payment of a levy on agricultural exports to the EC no longer would be a net cost to Portugal. The funds would have to flow back to Portugal in accordance with the budgetary arrangement. Such an arrangement would not appeal to the EC,

which prefers lump-sum compensation to guarantees of "just return." But budget refunds, as for the United Kingdom and Germany, as well as the special arrangements for Greece, seem to be becoming more widespread. Some scheme that limited net budget impacts for Portugal might be introduced in the future. In that case, the analysis of social profitability would need to take into account these budgetary arrangements.

In the absence of a ceiling on net contributions, Portuguese policy toward the CAP should center on maximizing the flow of funds from EC sources consistent with their profitable employment (taking into account that the rate of return on domestic counterpart funds must equal or exceed the return elsewhere). Portugal might wish to avoid, where possible, EC restraints on the production of commodities in which Portugal has a comparative advantage and to produce all that can be produced efficiently at internal EC price levels, regardless of the EC market balance. Most importantly, Portuguese policy should attempt to ensure the rapid development of marketing and processing channels so as to take advantage of new trading opportunities within the EC and to avoid being disadvantaged by the more aggressive marketing of others.

Conclusion

Major changes will have to take place in Portugal's agricultural sector to accommodate further EC commodity policies. Harmonization to EC prices will reduce profitability in a number of farming systems and regions; in others profitability will increase. By using the flexibility provided in the treaty of accession, the government can delay the decline of profitability for some farming systems. Macroeconomic considerations and consumer concerns might argue for bringing real prices down faster than the treaty would require. One way of doing this would be to delay the depreciation of the green escudo. Such a strategy would also provide more flexibility for the government than an early reduction of Portuguese prices, since later depreciations of the green escudo could then be used to counteract the effects of downward price adjustments.

There is little hope that changes in the economic environment will ease the adjustment pressure on farming systems that face declining profitability. The CAP is under increasing financial pressure, and it appears unlikely that changes in economic conditions inside or outside the EC will lessen this pressure. The tendency to reduce real CAP support prices will remain strong. Indeed, it would not be in Portugal's interest to resist this tendency. Changes in macroeconomic conditions in Portugal, in particular a depreciation of the escudo in real terms, could reduce the pressure on real farm prices within Portugal. But it is neither likely nor desirable

that such changes in macroeconomic conditions should be deliberately brought about for agricultural policy reasons.

It seems inevitable, therefore, that Portuguese agriculture will go through a phase of technical and structural adjustment during the transition period following accession. This adjustment will take place at the same time as, and will be fostered by, the changes in the institutional structure of agricultural marketing in Portugal. State agencies will give way to private trading firms in both domestic and international trade. There will also be increasing scope for cooperatives in agricultural marketing. Intervention agencies will be created in accordance with EC requirements. The increasing role of private traders in agricultural marketing could increase dynamism and efficiency. This eventuality would be beneficial for both agriculture and the overall economy in Portugal.

13. Future Policies Influencing Agricultural Factor Markets

by Eric Monke

This chapter discusses the implications for agriculture of alternative sets of factor price projections over the next decade. Future changes in the returns to labor and capital in Portugal will depend most heavily on investment and growth in the nonagricultural sector. Agriculture accounts for only a minor share of the total demand for labor and investment, and continued structural change will diminish further the sector's role in the factor markets. Economic developments in other EC countries are critical to the growth of the nonagricultural sector. EC markets will become increasingly important as export outlets after accession, and thus Portugal's expansion of output and foreign investment will be determined in part by growth in EC demand. Moreover, the prominence of rural emigrants in EC countries suggests that rural wage-rate changes will be influenced by the direct demand of EC member economies for unskilled and semiskilled labor.

Realization of domestic growth potential, however, will depend on domestic macroeconomic policy, including interest-rate policy, the allocation of financial capital between private and public industries, the magnitude and financing of the government budget deficit, and the size and treatment of foreign capital inflows. In the long run, economic growth usually is associated with a rising level of real wages (although changes in skill level complicate the interpretation of this trend) and a declining rate of return to capital investment. During a single decade, however, factor price changes and their relationship to economic growth are much less predictable. Short-run shifts in government policies and changes in technology or factor supplies can overwhelm long-run trends in factor prices. Recent Portuguese experience demonstrates clearly that real wages and rates of return to capital can move in any direction in the short and medium run.

Price developments in the agricultural land market also depend on growth in the nonagricultural sector, but the influence is less direct. Land is a fixed input, and changes in labor and capital costs will alter profitability in agriculture and, hence, feasible rental rates and sales prices for land. But agricultural policy plays a critical role as well. Development and dissemination of new technologies influence profit levels and land values.

Moreover, land market policies for rental rates and consolidation and the availability of credit for land purchases are likely to influence the rate of technology adoption and, in turn, the prices for land.

The following section of the chapter develops alternative scenarios for future changes in the financial capital and labor markets, with particular attention to the policy changes that might affect those markets. It then presents the implications of the scenarios for returns to present agricultural technologies. These estimates give some indication of the pressures on various agricultural systems to alter technological practices. The third section of the chapter presents estimates of projected policy transfers to or from the various agricultural systems and considers future policy options in the agricultural factor markets. For systems that face adverse changes in profitability, the options are limited to increases in income transfers or further efforts to develop new technologies. In both circumstances, substantial alterations in current agricultural policy appear necessary.

The Effects of Nonagricultural Change on Agricultural Factor Prices

The base case projected scenario is of a modest rate of economic growth, averaging 1.8 percent annually, during the next decade. This growth rate is associated with annual wage-rate increases of 1.8 percent and constant returns to capital. Deviations from the scenario will depend most importantly on changes in the growth rate of the industrial countries with which Portugal trades. Higher levels of economic activity, particularly in the EC, will create the potential for higher growth rates in exports; stagnation in external markets will greatly limit Portuguese expansion. In the latter case, Portuguese exports can grow only by displacing production from other countries, and other EC countries are likely to fight the loss of market share with subsidization of their own domestic industrial production. Although such responses are not considered appropriate under the Treaty of Rome, free trade remains an elusive goal of EC policy. Recent EC experience suggests that the worst trade barrier problems occur under conditions of economic stagnation.

Labor Market

Increases or decreases in external growth will have impacts on the labor market that go beyond the effects transmitted through export markets for Portugal's outputs. Emigration absorbs nearly one-third of the Portuguese labor force; workers come primarily from rural areas, and emigrant workers outnumber agricultural sector employees in Portugal by a two to one margin (only 1 million people were employed in agriculture in 1982).

Substantial changes in net emigration would have a significant impact on wage rates, particularly in the agricultural sector. Recent experience confirms the importance of this impact. In 1982–83, real wages in agriculture declined faster than industrial sector wages. This change is associated with an unprecedented change in emigration, from a net outflow to a net inflow, because demand for emigrant labor contracted sharply in the face of economic recession and high domestic unemployment in EC countries. Portuguese workers have a good reputation among foreign employers and thus have been affected less adversely than other emigrant workers within the EC. But further increases in EC unemployment rates would begin to impinge more heavily on jobs held currently by Portuguese workers. To reflect these possibilities, a negative growth scenario has been developed; it assumes an annual decline in real wages of 1.5 percent.

Although recession in the EC countries is likely to generate downward pressure on Portuguese wage rates, a strong upturn in economic growth appears less likely to increase demands for emigrant labor. Portuguese workers will have the right to free movement in the EC (beginning seven years after accession). But the cost of Portuguese labor to other EC employers will approach the cost of local labor as benefits and access to social services are increased under EC labor laws. Outside of jobs in the informal service sector and seasonal agricultural work, employment opportunities are not expected to expand much beyond current levels. Under high growth conditions, therefore, increases in wage rates are likely to depend largely on labor demand growth within Portugal. For the high growth scenario, real wages are assumed to increase by 2.5 percent per year, a rate of change about one-third larger than that of the base case.

Credit Market

The behavior of the rate of return to capital under alternative growth scenarios is more problematic, because of the importance of government credit policy. In the event of a long-term recession, government budget deficits could increase. If these deficits are financed by government borrowing from the domestic credit system, the public sector share of credit is likely to increase and private sector credit is likely to be affected even more adversely than during the recent past. In addition, policymakers might be tempted to decrease further the real interest rates on time deposits in an effort to increase involuntary transfers from the financial sector. Assuming that quantitative controls on the supply of credit are maintained as the principal instrument to control inflation, the behavior of the rate of return will depend increasingly on credit allocation mechanisms, and the capital market will become increasingly fragmented. For the negative growth scenario, private real rates of return to capital are assumed to decline by two percentage points, from 4 to 2 percent for

unsubsidized credit and from 2 to 0 percent for subsidized credit; social rates of return are assumed to hold constant.

Sharp increases in growth rates are likely to require significant adjustments in credit market policy. Liberalization of capital markets (free foreign inflows and outflows) is probably a precondition for significant increases in investment activity. Real rates of interest on savings will have to increase. Foreign investors are likely to commit only a portion of required equity, and some liberalization of domestic credit policy will be needed to allow complementary increases in domestic capital mobilization. These changes would cause a reduction in segmentation of the financial capital market; thus private returns to capital investment in agriculture (4 percent) would increase toward their social value (8 percent). However, increased investment simultaneously would lower the marginal rate of return. For the high growth simulations, both private and social rates of return are assumed to reach 5 percent at the end of the decade. In terms of annualized capital costs, private costs of capital will increase by less than 1 percent per year and annual social costs will decline by about 2 percent.

Projected Profitability

Table 13.1 presents data for private profitability of agricultural systems under the alternative growth scenarios. The most notable feature of the results is the dearth of cases in which profitability changes from negative to positive (or vice versa) as the factor price assumptions are altered. Sign changes occur for only four of the commodities. Sheep, beef, wheat on high-quality soils, and traditional wine systems in the Northwest retain positive profitability under the negative growth scenario; and the *ramada* wine technology of the Northwest becomes negatively profitable under the high growth scenario (because of rapidly rising real wage rates). Factor price changes in the next decade thus appear unlikely to offset much of the effect of the changes in the prices of outputs and purchased inputs associated with membership in the EC. In this sense, the agricultural sector appears to be relatively insulated from the cyclical changes in the economy that are represented by the high growth and negative growth scenarios. The magnitude of returns to agricultural land, a fixed factor, will alter as capital and labor costs change, but in few circumstances will factor price changes render producers unable (or able, in the case of negatively profitable systems) to cover variable cost payments.

Table 13.2 presents data on farm-level profitability and land rental rates on a per hectare basis, categorized by soil type. With the exception of traditional technologies in the Northwest, most systems were able to cover market rental rates for land in 1983. In general, market rental rates (and sales prices as well—see chapter 4) are determined by agricultural

considerations. The results show further that land commands no fixed share of fixed factor returns. In systems that require more management expertise, the share of profit taken by landowners is likely to be reduced. Profitability after land rent is deducted is especially large in the Ribatejo and for the specialized technologies of the Northwest.

The right-hand columns of Table 13.2 contain estimates of profitability per hectare in 1996 under the three alternative growth scenarios. Declines in the profitability of some crop systems do not imply necessarily that land rental rates or sales prices will decline, even if technologies remain unchanged, because substitution among alternative crops could sustain farm profitability. In many instances, profitability changes are substantial enough to encourage significant shifts in crop mixes. On A and B soils in the Alentejo, sunflowers become more profitable than wheat. Similar changes occur in the Ribatejo, where sunflower profitability increases relative to that of wheat and corn. Returns to sugar beets are substantially larger in per hectare terms than those for the other Ribatejo field crops, but production technologies are hypothetical. Returns to irrigated crops remain high under all scenarios, suggesting that development of additional irrigated areas in the South and Center will remain a major issue in Portuguese agricultural investment policy. Again, EC-imposed constraints could prove important, particularly if processed tomatoes remain a dominant crop. But the projections indicate that rice and melons are equally or more profitable.

Tables 13.1 and 13.2 indicate that the most difficult problems over the accession period will involve the poor-soil areas of the Alentejo and the small farms in the Northwest. In the base case and high growth scenarios, none of the poor-soil systems of the Alentejo is projected to be profitable. Positive profitability under the negative growth scenario will be present only for the livestock systems. Without further changes in policies or technologies, grains are destined to disappear from the poor-soil areas. Although land prices are relatively low for this category of soils (50 to 75 contos per hectare), individual holdings tend to be large. The representative sheep system requires 120 hectares, the wheat farm 200 hectares, and the beef systems 150 hectares. Present owners of poor-soil lands thus face considerable potential declines in net worth over the next decade.

For many northwestern farmers, significant declines in wealth also appear imminent. Landholdings are small (nearly three-fourths of the agricultural area in the Northwest and the Beira Litoral belongs to farms less than 20 hectares in size), but land values are high (averaging more than 1,000 contos per hectare). Much of the wealth of small landholders is contained in the value of their land, and the movement in projected profitability will adversely affect income distribution by lowering the wealth of an already poor segment of the population. In the base and high

TABLE 13.1. *Private Profitability of Selected Agricultural Systems under Alternative Growth Scenarios, 1986–96 (in 1983 Escudos per Kilogram of Final Product)*[a]

Region and System	Low Growth			Base Case			High Growth		
	1986	1991	1996	1986	1991	1996	1986	1991	1996
Alentejo									
Wheat, good soil	7.92	4.82	1.29	7.76	3.84	−0.49	7.70	3.48	1.19
Wheat, poor soil	1.75	−1.13	−4.45	1.52	−2.54	−7.02	1.43	−3.06	−8.03
Sheep, medium technology	36.26	12.79	9.19	28.94	−31.07	−71.28	26.76	−45.11	−98.93
Sheep, high technology	54.94	27.24	19.72	49.41	−5.79	−40.74	47.76	−17.00	−62.70
Beef, pasture-fed	−20.70	−21.80	12.30	−32.00	−49.70	−31.20	−25.20	−49.00	−38.30
Sunflowers, dryland	5.76	7.08	7.22	5.31	4.40	2.33	5.16	3.43	0.44
Rice, Sado Valley	15.56	13.53	17.14	15.33	12.16	14.64	15.25	11.67	13.68
Tomato paste	4.28	27.16	27.31	3.08	19.99	14.16	2.72	17.68	9.62
Ribatejo									
Wheat	12.20	9.08	5.54	12.05	8.18	3.91	12.00	7.83	3.23
Corn	8.85	8.60	4.37	8.63	7.29	1.96	8.57	6.86	1.12
Sunflowers	20.35	21.07	20.67	20.08	19.49	17.77	20.00	18.94	16.70
Tomato paste, owned	−0.13	22.91	23.21	−1.41	15.23	9.11	−1.78	12.83	4.37
Melons, *seareir*	7.10	7.57	8.00	6.92	6.44	5.93	6.87	6.13	5.30
Sugar beets	30.45	16.26	13.72	29.75	12.14	6.20	29.50	10.53	3.10
Wine	8.57	10.75	12.78	7.77	5.97	4.00	7.53	4.45	1.00
Rice, Sorraia Valley	24.72	22.06	28.37	24.15	18.62	22.09	23.96	17.43	19.77

Azores									
Cheese, edam	179.30	108.10	61.60	157.60	64.00	4.30	175.10	82.20	13.10
Northwest									
Milk, traditional	−141.70	−180.50	−196.60	−160.80	−295.50	−408.40	−165.70	−327.60	−472.60
Milk, small	24.60	−37.00	−75.00	8.50	−97.90	−181.60	13.20	−106.80	−206.10
Milk, medium	89.29	22.63	−21.33	65.17	−20.83	−85.13	83.43	−13.01	−87.71
Milk, large	75.74	9.40	−34.64	48.43	−34.88	−97.07	70.34	−23.42	−95.71
Corn, regional varieties	−1.71	−0.61	−3.60	−2.47	−5.22	−12.09	−2.68	−6.57	−14.76
Corn, hybrid varieties	0.37	1.30	−1.84	−0.35	−3.05	−9.86	−0.54	−4.27	−12.30
Potatoes, traditional	3.12	3.56	3.96	22.94	2.50	2.02	2.90	2.21	1.43
Potatoes, medium	3.07	3.50	3.91	2.92	2.64	2.34	2.87	2.33	1.73
Potatoes, large	3.89	4.26	4.60	3.76	3.48	3.18	3.72	3.22	2.67
Wine, traditional	−5.39	−1.87	1.13	−5.98	−5.41	−5.31	−6.19	−6.73	−7.89
Wine, *ramada*	5.10	6.91	8.59	4.53	3.48	2.34	4.32	2.18	−0.18
Wine, *cordão*	33.30	34.63	35.86	32.90	32.27	31.57	32.75	31.30	29.71

SOURCE: PES team estimates.
[a]Except for wine, which is per liter.

TABLE 13.2. *Farm-Level Profitability and Land Rent by Soil Type and Crop, 1983 and 1996 (in Thousands of Escudos per Hectare)*

Region, Soil Type, and Crop	1983		1996 Profitability		
	Profitability	Land Rent	Low Growth	Base Case	High Growth
Alentejo					
Dryland, A and B soils:					
Wheat	23.0	3.45	4.2	1.1	−0.1
Sunflowers	2.8	3.45	4.7	2.6	1.7
Dryland, C and D soils:					
Wheat	7.6	2.0	−4.9	−8.0	−9.3
Sheep, medium technology	10.8	1.0	0.2	−1.3	−1.8
Sheep, high technology	3.8	0.5	0.6	−1.0	−1.6
Beef, pasture-fed	2.4	0.5	0.3	−0.8	−1.0
Irrigated:					
Rice	64.9	40.0	94.0	83.6	79.6
Tomatoes	79.3	25.0	109.5	85.1	78.2
Ribatejo					
Dryland, sprinkler irrigation:					
Wheat	60.2	20.0	28.8	24.0	21.9
Corn	87.5	20.0	42.2	28.4	23.5
Sunflowers:	31.9	20.0	38.3	33.8	32.1
Sugar beets	140.5	20.0	51.1	35.4	30.0
Wine					
Flood irrigated:					
Tomatoes	48.8	45.0	88.5	51.8	41.5
Melon	139.6	45.0	158.0	126.4	116.7
Rice	77.6	45.0	126.1	105.8	98.8

Azores					
Dryland:					
Milk	36.0	10.0	41.6	24.4	30.1
Northwest					
Dryland, traditional technologies:					
Milk	−85.4	23.0	−65.3	−137.9	−160.0
Corn	−0.5	23.0	−7.2	−31.8	−39.5
Potatoes	48.2	23.0	56.8	31.5	23.8
Wine	−43.4	20.6	−4.4	−45.5	−61.1
Dryland, medium technologies:					
Milk	75.9	23.0	−10.4	−94.6	−89.6
Corn	9.6	23.0	−3.2	−34.3	−43.7
Potatoes	61.4	23.0	74.6	48.4	37.8
Wine, *ramada*	27.7	57.7	61.5	19.0	3.0
Dryland, specialized technologies:					
Milk	56.5	23.0	−35.0	−116.6	−104.4
Potatoes	78.8	23.0	88.6	65.2	56.6
Wine, *cordão*	243.8	144.4	260.3	236.3	226.6

SOURCE: PES team estimates.

growth cases, all of the milk and corn systems and two of the three wine production systems face negative profitability. Only potatoes and the highly specialized wine systems offer prospects of positive profits, but it seems unlikely that a majority of current milk producers will find expanded opportunities in potato and wine production. Expansion of potato areas is constrained by rotational limitations and risk of nematodes, and both commodities will depend on growth in yet undeveloped export markets. In the wine system, most of the change in profitability across technologies is caused by a shift from low-quality red to high-quality white *vinho verde*. This profitable shift depends heavily on export demand.

If the rest of the economy is assumed to grow significantly (under the base and high growth scenarios), major subsectors of agriculture in the Alentejo and the Northwest will be unable to cover variable costs or will be forced to accept returns to family labor that fall increasingly below the wage level of the remainder of the economy. The implications of the negative growth scenario are gloomy as well. In spite of simulated declines in wage rates and capital costs, returns to most of the northwestern corn and dairy systems still will be negative. In the Northwest systems, the changes in wage rates already imply significant declines in farm income, because almost all of the labor input is provided by the family. The specter of rapidly declining income levels in areas already plagued by a high incidence of poverty would undoubtedly create substantial political unrest, and even the continuation of EC membership could be vulnerable in the event of such adverse economic change.

Policy Transfers and Agricultural Policy Options

Table 13.3 tabulates the policy transfers (under an assumption of no market failures, the difference between private and social profitability) that will occur under alternative growth scenarios. In almost all systems, the magnitude of policy transfers will decline precipitously between 1986 and 1991, reflecting the generally adverse impacts on profit of harmonization to CAP pricing rules. By full harmonization in 1990, policy transfers will become small relative to output values in almost all commodity systems. In the high growth scenario, capital subsidies will be eliminated by the need to accommodate growth, and the net effects of policy will be limited largely to taxes on labor, a few intermediate input subsidies, and continued intervention in the prices of some by-products, such as wool. In none of the systems will policy transfers be sufficiently large to create positive private profitability in the presence of negative social profitability. Social and private profitability will diverge more in the low growth scenario than in the base case; this result will be caused by a widening gap between the private and social rates of return to capital. In spite of this

divergence, transfers are sufficiently large to convert negative social profitability into positive or breakeven levels of private profitability in only four systems—sheep and pasture-fed beef in the Alentejo and the traditional and *ramada* wine systems in the Northwest.

Attempts to Increase Policy Transfers

Two alternative courses of action face policymakers desiring to offset the adverse changes in profitability associated with EC accession. The first option involves attempts to increase policy transfers—the divergences between private and social profitability—in the direction of their 1983 levels. However, under the CAP, the opportunities for renewed intervention in the output and intermediate input markets appear bleak (chapter 12). Similar conclusions apply to the efficacy of increased transfers through the factor markets; special programs to subsidize agricultural labor and credit will have only a limited impact on sustaining particular systems. The results from the low growth scenario can be interpreted to represent the effects of a policy to subsidize domestic factors, in which the costs of labor and capital are reduced by about 20 percent relative to their 1983 values. If these programs were targeted to the Alentejo drylands and the Northwest, some of the affected systems would achieve positive profitability; sheep and beef production in the Alentejo and the larger milk and modern corn systems in the Northwest would offer some hope of positive returns to fixed inputs. But wheat on poor soils in the Alentejo and the smaller milk systems in the Northwest would continue to provide low returns. Transfers would need to be in excess of 20 percent of labor and capital costs under the base case assumptions and still larger under the high growth scenario.

The budgetary costs of such programs would be extraordinarily large, because of the prominence of wheat and livestock in poor-soil areas of the Alentejo and of dairy and corn in the Northwest. In addition, the administrative complications of directing subsidies to particular areas would prove formidable; recent experiences with credit allocations through IFADAP, for example, suggest that leakages from less to more profitable uses within a given region are difficult to control. The region-specific nature of the capital subsidy would increase further the opportunities for leakages by encouraging illicit interregional transfers. Finally, the long-term impacts of subsidized interest rates will encourage the adoption of additional disincentive policies in financial capital markets. Government budget constraints encourage policymakers to effect transfers indirectly by suppressing interest rates on savings, thus discouraging capital formation in favor of present consumption. Although low borrowing rates encourage investment, they do so only for firms with access to credit. In this regard, recent Portuguese experience parallels that of many developing

TABLE 13.3. *Policy Transfers to Selected Agricultural Systems under Alternative Growth Scenarios, 1986–96 (in 1983 Escudos per Kilogram of Final Product)*[a]

Region and System	Low Growth			Base Case			High Growth		
	1986	1991	1996	1986	1991	1996	1986	1991	1996
Alentejo									
Wheat, good soil	10.62	0.58	0.87	10.55	0.14	0.07	10.41	−0.64	−1.31
Wheat, poor soil	11.21	1.30	1.72	7.99	0.66	0.57	10.90	−0.50	−1.52
Sheep, medium technology	176.60	186.40	195.49	174.04	171.31	168.33	168.56	139.37	111.30
Sheep, high technology	133.70	142.27	150.22	131.55	129.66	127.60	126.57	100.66	75.90
Beef, pasture-fed	131.00	66.60	71.90	121.70	58.50	57.30	126.40	39.90	24.10
Sunflowers, dryland	7.95	1.82	2.58	7.75	0.63	0.46	7.39	−1.48	−3.32
Rice, Sado Valley	8.92	1.08	1.46	8.81	0.46	0.36	8.64	−0.56	−1.47
Tomato paste	2.31	4.07	5.70	1.83	1.20	0.52	1.06	−3.27	−7.52
Ribatejo									
Wheat	13.11	3.09	3.40	13.03	2.61	2.55	12.87	1.71	0.93
Corn	10.43	1.91	1.32	10.34	0.49	0.38	10.20	−0.33	−1.09
Sunflowers	7.52	1.00	1.40	7.41	0.34	0.23	7.22	−0.77	−1.76
Tomato paste, owned	3.04	4.70	6.25	2.58	2.02	1.40	1.84	−2.33	−6.41
Melons, rented	−0.72	−0.54	−0.38	−0.78	−0.87	−0.98	−0.83	−1.21	−1.59
Sugar beets	−0.95	0.53	1.90	−1.30	−1.52	−1.77	−1.86	−4.82	−7.69
Wine	2.98	4.08	5.10	2.68	2.32	1.92	2.21	−0.46	−3.07
Rice, Sorraia Valley	11.35	5.26	6.14	11.10	3.83	3.59	10.75	1.78	−0.10

Azores									
Cheese, edam	247.40	7.00	10.70	227.80	−0.20	−2.20	244.70	−9.00	−18.20
Northwest									
Milk, traditional	313.40	70.60	81.40	310.70	55.10	53.70	305.00	21.80	−5.70
Milk, small	278.30	27.60	32.60	269.90	19.40	17.80	274.40	5.00	−8.00
Milk, medium	301.91	50.49	56.81	280.58	40.81	39.50	296.80	20.65	3.47
Milk, large	309.15	57.02	63.28	284.25	47.32	45.91	303.87	26.21	8.23
Corn, regional varieties	12.89	3.72	4.25	12.76	2.97	2.93	12.48	1.32	−0.03
Corn, hybrid varieties	11.75	2.46	2.89	11.65	1.84	1.78	11.43	0.60	−0.45
Potatoes, traditional	1.75	0.66	0.77	1.72	0.48	0.46	1.66	0.14	−0.15
Potatoes, medium	2.52	1.50	1.67	2.49	1.34	1.40	2.37	0.65	0.19
Potatoes, large	2.11	1.08	1.25	2.07	0.83	0.80	1.98	0.30	−0.14
Wine, traditional	11.21	12.24	13.19	10.99	10.98	10.97	10.38	7.42	4.65
Wine, *ramada*	11.82	12.86	13.83	11.59	11.56	11.52	10.96	7.91	5.03
Wine, *cordão*	11.68	12.56	13.37	11.49	11.46	11.42	10.92	8.11	5.47

SOURCE: PES team estimates.
*Positive values reflect a subsidy, and minus (−) values reflect a tax.

countries, where large farmers receive preference over small farmers and dualism in farm structure is encouraged.

Attempts to Change Agricultural Technologies and Farm Sizes

The continuation of agricultural activity in much of the Alentejo and the Northwest must depend largely on technological change. If new technologies can be developed, land market policies will be a key determinant of the extent to which these new alternatives will be adopted. Most potential improvements in efficiency depend on larger farm size. The movement from traditional to medium to large milk farms, for example, requires significant increases in farm size (from 1 to 4 to 12 hectares). Conditions of positive economic growth also are important in the process, since the demand for labor from the nonagricultural sector will facilitate out-migration from agriculture and increase the potential availability of land to the remaining farms.

Table 13.4 provides some indication of the magnitude of the structural problem for Portuguese agricultural land. The vast majority of farm operations are under 20 hectares, and they account for 40 percent of cultivated area. The farms of this size contain numerous small parcels of land. The national average parcel size is only 0.3 hectares in the 1 to 4 hectare farms, and region-specific values do not deviate much from this value. For the 4 to 20 hectare farms, the average parcel size is generally less than 1 hectare. These data overstate the magnitude of the structural problem, because farms under 1 hectare generally are not commercially oriented; many of the 1 to 4 hectare operations in the South are in similar circumstances. But in the North, most commercial farm operations fall in the 1 to 20 hectare range, and this region will impose the greatest pressure on land markets to accommodate changes in production technologies.

Comparisons of the data from the two agricultural censuses, 1968 and 1979, allow characterization of the structural changes that have occurred in recent years. Changes in average farm size (not shown) ranged from 10 to 25 percent within each size category. The data on changes in the number of parcels (Table 13.5) give some indication of how these increases were achieved. Among farms under 4 hectares, growth was achieved by increasing the number of parcels per farm. Among large farms (50 or more hectares), growth was accompanied by consolidation. Table 13.5 indicates that this pattern of change was causing an increasingly dualistic farm structure. While large farms were increasing in size and in share of agricultural area, small farms were growing increasingly prominent as well. The medium-size farms (4 to 100 hectares) suffered substantial declines in their share of cultivated area. Almost all of the decline in cultivated area among these farms is accounted for by increases in cultivated area among operations under 4 hectares. Growth within the larger size categories (in

TABLE 13.4. *Farm Distribution and Parcel Size, by Region and Size Category of Farms (in Hectares), 1979*

(a) Percentage of Farms in Each Size Category and Total Number of Farms

Region	Size Category (in Hectares)								Total Number of Farms
	0–0.9	1–3.9	4–19.9	20–49.9	50–99	100–199	200–499	500+	
North	55.26	30.55	13.05	0.87	0.14	0.05	0.04	0.03	271,100
Entre Douro e Minho	64.75	27.18	7.57	0.37	0.07	0.03	0.02	0.01	187,600
Trás os Montes	33.94	38.13	25.36	1.99	0.31	0.11	0.08	0.08	83,500
Beira Litoral	58.59	33.41	7.39	0.43	0.10	0.04	0.02	0.01	251,400
Beira Interior	42.66	36.94	18.06	1.58	0.36	0.18	0.13	0.09	86,600
Ribatejo	49.36	36.70	12.13	1.15	0.32	0.16	0.13	0.06	187,700
Alentejo	32.00	28.85	24.38	6.77	2.93	2.12	1.94	1.00	64,100
Algarve	36.02	37.11	23.78	2.26	0.48	0.23	0.11	0.02	34,300
Mainland average	51.34	33.39	12.97	1.35	0.40	0.24	0.20	0.11	895,100

(b) Average Parcel Size in Each Size Category (in Hectares) and Total Number of Farms

Region	Size Category (in Hectares)								Total Number of Farms
	0–1	1–4	4–20	20–50	50–100	100–200	200–500	500+	
North	0.15	0.34	0.64	1.37	3.63	15.20	55.94	331.67	0.46
Entre Douro e Minho	0.15	0.38	1.04	3.01	7.39	68.08	128.29	547.83	0.45
Trás os Montes	0.15	0.30	0.53	1.13	3.08	11.09	36.38	310.45	0.46
Beira Litoral	0.10	0.20	0.42	1.52	3.96	8.30	19.36	66.76	0.26
Beira Interior	0.18	0.37	0.75	2.04	4.90	16.48	45.10	114.39	0.82
Ribatejo	0.15	0.34	0.87	2.98	7.78	19.80	52.59	317.49	0.77
Alentejo	0.40	1.21	3.06	8.25	17.04	37.92	94.93	425.04	14.94
Algarve	0.30	0.63	1.22	3.78	8.67	12.72	34.81	48.09	1.20
Mainland average	0.14	0.31	0.76	2.64	7.77	22.49	66.02	300.85	0.86

SOURCES: Census of Agriculture, 1979.

TABLE 13.5. *Changes in Cultivated Area and in Number of Parcels per Farm, by Region and Size Category of Farms (in Hectares), 1968–79*

(a) Percent Change in Cultivated Area in Each Size Category

Region	Size Category (in Hectares) 0–1	1–4	4–20	20–50	50–100	100–200	200–500	500+	Average
North	85.37	13.40	−16.39	−38.72	−15.16	50.01	214.96	500.58	12.97
Entre Douro e Minho	71.28	0.90	−21.55	−23.42	−5.54	192.65	976.75	278.85	10.19
Trás os Montes	145.34	36.08	−13.26	−43.12	−18.07	21.70	88.12	568.37	14.84
Beira Litoral	65.98	0.43	−20.64	−5.13	4.19	35.64	206.84	149.22	8.54
Beira Interior	164.44	7.50	−31.85	−48.83	−44.60	−17.09	−27.04	−24.25	−25.51
Ribatejo	71.17	5.86	−2.20	17.05	14.30	41.71	61.98	23.25	16.99
Alentejo	54.54	−1.11	−5.14	7.44	19.60	34.54	39.17	−4.37	7.06
Algarve	216.35	36.41	−0.46	−40.27	−52.26	−32.05	−32.74	−72.00	−19.17
Mainland average	82.28	7.46	−14.96	−19.66	−4.83	25.18	39.22	4.89	3.67

(b) Percent Change in Number of Parcels per Farm in Each Category

Region	Size Category (in Hectares) 0–1	1–4	4–20	20–50	50–100	100–200	200–500	500+	Average
North	−57.71	−50.74	−17.22	−9.70	−32.34	−59.01	−86.03	−96.04	−36.91
Entre Douro e Minho	−64.49	−67.39	−61.19	−14.28	−26.13	−72.84	−53.00	25.75	−65.76
Trás os Montes	35.25	27.70	22.89	−3.76	−27.10	−47.19	−85.08	−96.14	40.74
Beira Litoral	16.63	1.05	−7.28	−9.93	−14.89	−24.62	25.08	48.00	−2.49
Beira Interior	24.18	43.75	25.59	13.04	−9.94	−33.01	−49.22	−13.51	8.68
Ribatejo	4.81	3.92	−15.10	−22.50	−36.15	−24.11	−30.61	−41.93	−9.12
Alentejo	0.93	2.11	−7.39	−6.85	−8.40	−11.24	−20.05	−28.94	−6.12
Algarve	40.12	38.01	32.50	3.62	−19.46	−2.73	−30.75	−41.28	10.50
Mainland average	−23.98	−15.83	−8.76	−18.45	−36.39	−45.14	−46.36	−40.22	−16.66

SOURCES: Census of Agriculture, 1968, 1979.

the Alentejo, for example) can be explained similarly by reallocations from larger to relatively smaller farms.

These aggregate patterns conform to the result of the microeconomic analysis described in previous chapters—the small, full-time farmer has the least ability to buy and rent land. Currently, land market transactions by these farmers take place largely outside formal credit channels. About 2 percent of agricultural parcels change hands each year; during the 1978–83 period, the number of transactions ranged from 115,000 to 130,000 per year. During this time, only about 900 purchases of land were financed under credit lines of IFADAP; these data are understated, since many land purchases are made as part of farm investment projects. But fewer than 20,000 medium- and long-term loans were made between June 1979 and June 1984, and even if all these loans contained provisions for land purchases, the formal credit system would still account for less than 5 percent of the transactions in the land market.

In part, the small volume of lending could be the result of the availability of funds from alternative sources. Self-financing and "friendly neighbor" loans are noted most frequently where emigrants' remittances are prominent. The terms on these loans are generally more favorable than those on bank loans, because the borrower is competing against bank savings rates that are low or negative in real terms. But farmers who lack access to informal credit are largely excluded from the potential income increases offered by technological change. In the Northwest, for example, recent profitability of the traditional and small milk systems has been negative (−81 contos and −36 contos per hectare, respectively). Even substantial reductions in consumption cannot generate the financial capital necessary to double farm size and expand dairy herds. Potatoes offer profits, but rotational constraints limit the planted area per farm. Under current policies, therefore, farmers with access to off-farm sources of financing (through off-farm employment or emigration) will continue to dominate the land market and part-time farming will grow in prominence.

One set of policy changes that would have little budgetary cost involves regulatory reform of the credit market. A key constraint on the use of formal credit arises because current laws prohibit the division of land into parcels smaller than the alleged minimum unit of cultivation. These legalized minimum sizes are 0.5 hectare for horticultural crops, 2 to 2.5 hectares for irrigated land, 2 to 4 hectares for dryland in the Northwest, and 5 to 7.5 hectares for dryland in the South. In addition, if the loan is to qualify under the credit line for land (Code 534), the purchase must be part of a consolidation effort by the buyer. Most regional ministry offices interpret this restriction as requiring the purchase of a parcel contiguous with a parcel already owned by the prospective buyer.

Such arbitrary restraints constrain technological change on small farms, particularly in the Northwest. Expanded farm size is important for technological change, and production patterns demonstrate a clear trend of increasing average parcel size. The phenomenon of land swapping and producer interest in contiguous parcels confirms the advantage of consolidation. But the problem for the producer is that contiguous parcels become available only occasionally, usually as neighbors leave agriculture. In the meantime, the addition of parcels not contiguous to the farm offers small farms profitable opportunities to expand. Some minimum size of parcel is necessary for the mechanized corn and silage production of the advanced milk systems. But minimum sizes are on the order of 0.5 hectare rather than 2 hectares. Transportation costs also limit producer interest to a geographical area not too distant from the farmer's home. The recent growth of milk production in the Northwest suggests that these costs are more than compensated for by the higher profits of the nontraditional technologies. Consolidation could be a more important precondition for expansion of permanent crops, because of economies of scale in pesticide application and harvesting. But legal mandates are unnecessary to facilitate this change. In the Alentejo, parcel sizes appear to be sufficiently large to support specialization. In the Northwest, small farm owners usually have at least one relatively large parcel amenable to specialized production.

A second option for land policy involves attempts to target special lending programs to small, full-time farmers. Substantial reform of the Credit PAR system might provide one method of enabling full-time farmers to compete against those with access to off-farm sources of credit. Such a program could offer financing at rates comparable to those offered in the informal market (perhaps related to the interest rate paid on savings). Targeting the program to full-time farmers is a precondition for the success of the policy. If the program were applied universally to land purchases, current rents would be capitalized at program interest rates rather than at the true opportunity cost of capital. The only effects of a universal subsidy program would be to raise the price of land and transfer wealth from the providers of the subsidy (taxpayers) to sellers.

A final set of options for land policy involves reform of the rental market by the abolishment of rent controls and lifetime tenancy clauses (chapter 4). The likelihood of tenant exploitation has been reduced since the 1974 Revolution. In the South, about 1 million hectares of land were nationalized and redistributed, primarily to small holders and collective farms. Maximum area limits apply to owner-operators and absentee landlords. With an increase in the number of landowners, monopolistic exploitation of tenants appears to be unlikely in a liberalized rental market. In the Northwest, the growth of off-farm income from emigration and

domestic employment in rural industry has reinforced a wide dispersion in landownership. In the Entre Douro e Minho, the Trás os Montes, and the Beira Litoral, only 500 farms are more than 100 hectares in size. They account for 20 percent of agricultural area, but much of this land includes forest or unimproved pasture. Tenant farmers grow primarily field crops and would have little interest in these areas.

The principal impact of the rental laws has been to prevent potential renters from expanding their farm operations. This effect appears particularly important in the Northwest, where small farmers who lack the financial resources to purchase land coexist with caretaker farmers—individuals who operate the fields of absentee landlords for a nominal fee until the landlords' return. The aggregate significance of this pattern is not known, but the pattern appears to be particularly prominent where emigrants have purchased land in anticipation of their future return to Portugal. In these circumstances, rental laws cause a misallocation of land resources. Potential growth in small farmer income is again limited because of the inability of farmers to acquire land needed for improved technologies.

Conclusions

In most middle and upper income countries, the nonagricultural sector dictates the agenda for agricultural change, through changes in labor and capital costs that in turn influence the profitability of agricultural systems and, hence, the prices for land. Although the agricultural sector must generate changes in technology to offset negative profitability, nonagricultural growth and the consequent demand for labor are necessary to liberate the land resources and allow remaining farmers to increase farm size. The results of alternative growth assumptions suggest that, for Portuguese agriculture, the most intense pressures for change will involve the users of poor soils in the South and small dairy and grain farmers in the Northwest. In general, currently profitable systems in the remaining regions appear capable of generating positive profits in the future. The field crops grown on the good soils of the Alentejo, all the irrigated crops, the field crops of large farms in the Ribatejo, and the milk system of the Azores remain profitable under a wide range of possible changes in labor and capital costs.

Moderate increases in the magnitude of policy transfers through the labor and capital markets are not likely to have much impact on the projected pattern. But land policy will play a critical role in determining both the rate and the pattern of agricultural expansion. Current legislation has its most adverse impact on the small full-time farmer. If small farmers lack access to self-financing, restrictions on formal credit effec-

tively exclude them from the land market. Land rental laws discourage free market contracting and thus limit the ability of small farmers to realize the expansion in cultivated area essential for technological change and increased income. Although the justification for current land policy is couched in terms of protecting the small, full-time farmer, its consequences entail precisely the opposite effect.

14. Portuguese Agricultural Strategies

by Scott R. Pearson

The results of the empirical analysis identify agricultural systems and regions where profitability can be expected to be strong as well as those where significant adjustments will need to take place. These adjustments, in principle, can be accelerated or eased by policy. But the range of policy choices under direct Portuguese control will be restricted severely after the transition to full application of the CAP. Prices of the agricultural commodities that are regulated under the CAP will be set by the EC, in which Portugal has only one of twelve votes. The prices of traded farm inputs will be determined in the wider EC markets, and the prices of labor and capital will be influenced mainly by economywide phenomena, not by agricultural policymakers. The pace and diffusion of cost-reducing technological changes can be affected indirectly by public investment policy aimed at improving the rural infrastructure and applying the results of agricultural research. In this limited policy arena, what realistic choices remain for Portuguese policymakers to influence the future profitability of agricultural systems? This central issue is addressed by a consideration of alternative national strategies, possible regional adjustments, identification of investment priorities, and facilitation of technical and structural change.

Alternative National Strategies

In earlier chapters, the likely ability of principal agricultural systems to compete and survive within the EC was analyzed under varying assumptions. Taken together, these profitability results have important implications for the future direction of Portuguese agricultural policy. Countries with full control over their various policy instruments can opt for any agricultural strategy they desire, assuming that their farmers, consumers, and government budgetmakers are satisfied with the outcome. But members of economic communities (such as the EC) face a far narrower range of choices among agricultural strategies. For Portugal, three very different potential agricultural strategies are reviewed here. The purpose of the review is to demonstrate why only one of the choices is a realistic possibility now that Portugal has joined the EC.

Income Maintenance

Facing the prospect of significant adjustment, interest groups and policymakers often react by trying to minimize change in order to keep farm incomes at earlier levels. One prospective agricultural strategy is to minimize agricultural adjustment by enacting policies that attempt to maintain pre-accession levels of private profitability (at the level of the farm or of the system). As shown in the two previous chapters, four farm-level activities were privately unprofitable in 1983, fourteen (including the four initial ones) are projected to be unable to cover their variable costs after the transition to full EC membership in 1996, and twenty-seven of the thirty-three included in the study are expected to be less profitable in 1996 than they were in 1983 (the six exceptions are activities involved in producing sunflowers, rice, and tomatoes).

A strategy aimed at preserving the status quo farm incomes of 1983 therefore would have to create numerous, often large policy transfers to keep private profits at pre-accession levels. As argued in chapter 12, in the future, Portugal will be unable to use agricultural price policy to effect transfers to its farmers. And as demonstrated in chapter 13, Portuguese policies to alter factor prices (wage, interest, and land rental rates) are not likely to make large improvements in private profits at the farm level. Consequently, the use of policy instruments to create higher farm profits by altering product or factor prices either is ruled out because of EC membership or is insufficient to achieve the objective. The first strategy, to maintain farm incomes through product or factor price policies, is thus infeasible. Direct income transfers are permitted under the CAP but would be too costly in budgetary terms. Because this defensive strategy is unworkable, there is no need to have to weigh the potential benefits to farmers against the efficiency costs of preventing a reallocation of resources in response to changed conditions.

Import Substitution

In view of the prospect of Portugal's having to make substantial levy payments to the EC on third-country imports of feed grains or to pay high CAP prices for commodities originating in other EC countries (chapter 12), some observers have suggested a second strategy for Portuguese agricultural policy—to expand the domestic production of deficit commodities and thus to create substitutes for agricultural imports that will be more costly after Portugal gradually adopts the CAP. If followed to its limit, this import substitution strategy would permit the country to achieve self-sufficiency or even to expand production for export, emulating the experience of many other EC countries. The issue is whether it is feasible and desirable to pursue this second, more aggressive strategy, aimed at ex-

panding output to substitute for imports and ultimately to generate export supplies.

The base case projections point to the difficulties inherent in pursuing an import substitution strategy. The limitations on Portuguese use of commodity or factor price policy have been summarized earlier. Short of attempts to target interest rate subsidies for selected import-substituting activities (with the myriad difficulties these attempts would be likely to entail—chapter 13), few, if any, policies will be available to create import-substituting incentives by altering prices of outputs or inputs. Portugal thus will be restricted to using investment policy—allocations to agriculture from the public capital budget—to expand agricultural output in selected activities. The issue then turns on how best to select activities to receive public investment funds. Import substitution would require that the selection be made according to the deficit between domestic consumption and production—that is, net imports (after allowances for changes in stocks).

This criterion for selection, however, makes little sense. For example, Portugal's annual imports of corn recently have been in the 2 to 2.5 million metric ton range, thereby making corn-producing activities a prime candidate for import-substituting investment policy. Yet most of Portugal's domestic corn production occurs on small-scale farms in the Northwest, and these farms are projected to face negative profitability (using either traditional or hybrid varieties) at the end of the transition decade. The fact that large quantities of corn are imported does not imply that public investment in corn production would further Portugal's agricultural objectives. The success of public investment depends on an attractive price environment and on a technical package of high-yielding seeds and complementary inputs that can lead to cost-reducing technological change in farming or processing.

It would be a fortuitous coincidence if a ranking of investment projects according to import gaps were to result in rapid growth of agricultural output and incomes. As demonstrated in chapter 2, only socially profitable activities truly save (or earn) foreign exchange, so there is no special advantage in promoting activities that substitute for imports—unless they happen also to be efficient users of scarce domestic resources. Hence, the second strategy, expanding production by investing public funds in activities that substitute for imports, is undesirable because of the use of an inappropriate economic criterion for project selection.

Efficient Specialization

Once a country in effect cedes its price policymaking authority to a supranational organization, its principal way of influencing agricultural

development is through selection of public investment projects (including public or private research in agriculture). Portugal's choice of agricultural strategy for the next decade or more will be heavily conditioned by this reality. Preserving the status quo that existed prior to accession is not feasible, and investment to create substitutes for imports is unlikely to be desirable, even if feasible. A third, preferred strategy—efficient specialization according to comparative advantage—stands between the defensive and aggressive choices and dominates both. The measurement of efficiency using social profitability is described in chapter 2 and applied throughout this study. Although efficiency gains or losses are always important, they are by no means the sole basis for making policy decisions within this agricultural strategy.

During the coming decade, Portuguese agriculture is likely to be strongly influenced by two related forces—EC-dominated prices for commodities and inputs and steadily increasing real labor costs. With few exceptions, agricultural policymakers in Portugal will have little control over either of these forces. The first will be set annually by the EC, and the second will be determined by the growth rate of income in the entire Portuguese economy (of which agriculture constitutes only 12 percent). Policymakers thus will be faced with the reality of farmers clamoring for help because of substantial pressures for adjustment that arise from the shifting relative profitability of crops within regions. Yet the range of policy instruments available to alter the situation will be far narrower than it currently is. The pattern of profitability, analyzed in earlier chapters, will be altered importantly only by public investments that reduce input costs or raise output returns to farmers. (As will be discussed shortly, rural incomes could be supplemented by social welfare programs. But this income transfer would not change relative profits in farming activities and thus should be considered part of a rural adjustment strategy rather than an agricultural strategy.) In these circumstances, the critical issue for the design of an agricultural strategy is how best to employ scarce public investment resources.

Although Portuguese agricultural policymakers no doubt have a varied set of objectives in mind when they map agricultural development strategy, their decisions are likely to be dominated by four such objectives—efficient use of resources to obtain rapid growth of farm output and income, equitable distribution of income among agriculturalists and across regions, reasonably stable agricultural prices reflecting secure food supplies, and orderly structural adjustment as workers leave unprofitable agricultural activities and farm sizes gradually increase through addition or consolidation of parcels. The allocation of public investment funds typically involves trade-offs among these objectives. As an example, a prospective project to aid small- and medium-scale milk farmers in the

Northwest might be valued because it would enhance the incomes of relatively poor farmers and ease their pressures for rapid structural adjustment. But it also could be inefficient if, after the investment, the aided farmers still produced with negative social profits. In this instance, decisionmakers would have to weigh the distributional gains against the efficiency losses to judge whether the investment were of higher priority than other alternatives.

As Portuguese policymakers study the outcome of projected profitability among Portugal's agricultural commodities and regions, there is no reason to expect them to be either satisfied with or complacent about the expected pattern and its implications for change. A strategy based on specialization according to comparative advantage does not mean that the best role for government is to do little or nothing. Policymakers properly will want to find ways to achieve two separate goals. One is to assist farmers in the viable activities to improve their competitiveness by investing to change technologies. The other is to ease the painful costs of adjustment out of agriculture for farmers whose choices are bleak and whose activities are so unprofitable that they appear beyond rescue. The remainder of this chapter discusses ways in which the empirical analysis in this book can assist in this critical and difficult process. The discussion is, of course, drawn from that presented in detail, with tabular evidence, in the chapters on regions and policies.

Regional Adjustments

The need for adjustment, caused by CAP prices and rising real wages in the next decade, will differ widely across the agricultural regions of Portugal. The details concerning likely adjustments for individual systems, for competing systems within agroclimatic zones, and for trade-offs within regions have been presented in the regional chapters. And in chapter 13, the sensitivity of the base case results to differing assumptions about relative factor prices and factor market policies was analyzed carefully. The remaining task is to highlight the principal lessons on adjustment in the context of an agricultural strategy that focuses on efficient specialization within the EC.

All regions will face the need to make adjustments, but in some the prospect is for relatively small and uneventful change. Many of the farming systems in the Ribatejo and the Alentejo are expected to be highly competitive at EC prices. Some adjustment is anticipated, because wheat and corn will become less profitable while sunflowers, sugar beets, tomatoes, melons, and rice will gain in profitability within the CAP regime. But all irrigated systems easily can pay their land rents (Table 13.2), and switches among cropping systems should not present any major adjust-

ment difficulties. One large potential problem area that bears further investigation is the future ability of Portuguese marketing agents to penetrate the seasonal EC market for specialized fruits and vegetables, produced in irrigated systems in central and southern Portugal.

The dairy systems in the Azores, producing cheese and milk powder, also look to be in good competitive shape after the full transition to CAP prices. The private profitability of these activities will fall with gradually declining EC dairy prices but will remain positive (and higher then land rents); the social profitability will jump from negative (with world dairy prices) to very positive (with CAP prices as social valuations of output). Because of the projected decline in private profits, some marginal Azorean dairy farmers will likely be forced to leave farming, but no major structural adjustments are indicated.

Adjustment problems seem more acute in the Alentejo. Wheat and sunflower production on good soils (A and B quality) will remain profitable in 1996. The competitiveness of wheat will suffer a precipitous decline, with falling projected CAP prices, so that the 1996 profit no longer will cover 1983 land rent, but the profitability of sunflowers will fall only slightly under EC prices. The indicated adjustment for good-soil, dryland farming is away from wheat and toward sunflowers to the extent that rotations permit this shift. Adjustments on poor soils (C and D quality) appear much severer. The longstanding desire to move these lands from cereals to pastures is clouded by the empirical results; poor-soil wheat will become highly unprofitable in 1996, but so will pasture-fed sheep and beef, though to a lesser extent. For the poor-soil areas of the Alentejo, the critical need is to find cheaper ways of improving pastures and technical solutions to higher meat yields (including feed conversion and breed improvements). The other adjustment alternative seems to be to remove much of the C and D soil from agriculture and convert it to forestland, an option not investigated in this study. A critical research need is to study the costs and benefits of large- and small-scale irrigation systems to improve water availability in all of the Alentejo.

By far the most difficult and painful adjustments are projected to occur in northwestern agriculture. Most farmers in the Northwest have very small operations (under 4 hectares), and many are among Portugal's poorest people. Chapters 8 through 11 detail a remarkable success story—how the introduction of new technologies (corn silage, improved breeds of dairy cattle, and hybrid corn seeds) and organizations (collective milking parlors), along with supplemental earnings from off-farm work and emigrant remittances, permitted a significant increase in milk output and farm incomes. Price-responsive farmers saved, invested, changed agricultural technologies, and prospered.

The irony is that this very encouraging picture is expected to change

dramatically under EC policies. The Northwest's principal agricultural outputs—dairy products and low-quality wine—are commodities currently produced in the EC at levels greatly exceeding domestic consumption (chapters 3 and 12). Because EC protection permits domestic prices to be much higher than comparable world market levels, the surpluses must either be stored at high cost or be exported with large subsidies. The budgetary pressures of surplus disposal have caused EC policymakers to reduce real (inflation-adjusted) prices or to introduce quantitative controls on levels of output that will receive support. The decline in real prices for surplus commodities is projected to continue; Portuguese prices thus will be harmonized to gradually declining real projected EC prices. The deteriorating price environment, along with a projected steady climb in real wages (at a rate of 1.8 percent per year), will cause the northwestern dairy and low-quality wine (red *vinho verde*) activities to become highly unprofitable, in both private and social terms. The implication is that farmers and hired farm laborers will not be able to earn their opportunity costs in agriculture and will thus be attracted to off-farm or emigrant jobs if these are available.

Potential adjustments of the crop mix within the diversified whole farms of the Northwest do not appear to be a realistic alternative for the entire region. Cultivation of potatoes and high-quality wine grapes (white *vinho verde*) is projected to be competitive after EC accession. But wide-scale expansion of the former is restricted by disease problems and price uncertainties and of the latter by the unproved nature of the domestic and export markets. The diffusion of technological innovations (chapters 9, 10, and 11) from traditional to small-, medium-, or large-scale cultivation of milk, potatoes, or wine would alleviate the adjustment problem. Nevertheless, the empirical analysis shows that either new, cost-reducing technical changes will have to be discovered and introduced, a desirable but uncertain prospect, or the numbers of farmers, farm workers, and farms will have to decline significantly.

Portugal, in short, will soon face the complicated policy issue of how best to ease the painful process of structural adjustment in northwestern agriculture. This issue is, of course, a well-known problem in industrialized and newly industrializing countries; Portugal itself has seen agriculture's share of employment and income decline rapidly during the past twenty-five years (chapter 4). The process of structural change can occur smoothly if productive employment opportunities outside of agriculture (from rural industries or construction, urban activities, or overseas jobs for emigrants) increasingly absorb rural workers. Much of the recent improvement in rural standards of living in the Northwest can be attributed to such off-farm job opportunities, which in turn provided both savings for agricultural investment and the need to invest in new farming

technologies that used less (increasingly expensive) labor. Those concerned with rural welfare in the Northwest therefore must hope for successful macroeconomic development policies in Portugal and in the rest of the EC that will lead to growing off-farm job opportunities domestically and abroad.

The difficulty presented by the projections of highly negative agricultural profitability in the Northwest is the suddenness with which the pressures for adjustment could strike the farming population. The transition period helps somewhat, but within a very short time a substantial number of Portugal's farmers are likely to be faced with unprofitable farming operations (even if they value family labor at a rate that is much lower than the market wage). From previous parts of this and from earlier chapters, it is clear that commodity price policy on outputs and inputs will not be available to provide much help in easing structural adjustment pressures. Although factor price policies are less controlled by EC regulations, the analysis of chapter 13 leaves little hope for much adjustment assistance from this source. Improvements need to be made to remove existing impediments in the agricultural land and rural credit markets; even with improvements, many of the northwestern farming activities probably would remain unprofitable.

The best adjustment strategy is a two-pronged approach. One dimension would be to continue to reduce farming costs—to intensify existing efforts to identify technical improvements, to introduce them through public investment and extension, and to improve rural credit and land markets. The other dimension would be to recognize explicitly that rural adjustment is much more than an agricultural problem—to create programs of rural adjustment assistance that respond to the social need of helping farmers and laborers leave agriculture by providing job information, retraining, extended unemployment insurance, and long-term education for rural families. Both dimensions of this adjustment strategy could be aided by the creation of a special regional plan for structural aids in cooperation with authorities from the EC Commission. Whatever the solution, it seems clear that the likely magnitude of the adjustment problem in the Northwest will require imaginative policy actions that go well beyond the usual confines of agricultural policy.

Identification of Investment Priorities

The Ministry of Agriculture currently faces critical decisions on the allocation of public resources for Portugal's agricultural sector. The investable funds normally available in the government's agricultural development budget have been augmented by a grant of 50 million ECUs (about $US 48 million at mid-1986 exchange rates) from the EC for pre-accession

aid to agriculture. The EC also has promised to provide an additional 700 million ECUs ($US 670 million at mid-1986 exchange rates) during the ten-year transition period, 1986–96, when Portugal gradually will align its agricultural policy to that of the CAP. Moreover, with accession, Portugal has become eligible to receive aid from the EC under its various programs aimed at promoting structural adjustment. Agricultural policymakers in Portugal thus have been given an opportunity and a problem. The opportunity is to raise agricultural productivity and rural incomes by using public funds to accelerate technological change in agriculture. The problem is to identify government investment projects that will use these incremental resources efficiently throughout Portugal's diverse agricultural economy.

One purpose of this book is to contribute essential background information and analysis to help the Ministry of Agriculture seize its opportunity and solve its problem. By design, the book contains no identification, analysis, or ranking of specific public investment projects. That task is being carried out continually by ministry analysts at both the regional and central levels. The research results, explained in earlier chapters, instead focus on the economic performance of thirty-three of Portugal's principal agricultural systems, especially (but not exclusively) those producing grains, oilseeds, and livestock products. The main analytic concern is to measure how much policies help or hinder the production of agricultural commodities and how the current picture might alter as Portugal gradually adopts the CAP. The results presented in this book thus indicate the pressures for expansionary or contractionary adjustment that are likely to arise as Portugal's existing techniques of farming are confronted with future CAP prices and changing input costs. One type of adjustment, through the spread of existing improved technologies and the introduction of new, cost-reducing techniques, has been illustrated for farming systems in northwestern Portugal, a region in which significant adjustments are likely to occur.

Several links exist between project analysis by the Ministry of Agriculture and the analysis of agricultural systems reported here. A brief summary of them points out why this research provides essential information for public resource allocation. Ministry project analysts can use directly most of the study's research inputs: detailed budget data at the farming, processing, and marketing levels; catalogued information on the effects of current commodity, input, and factor policies; projections of the impacts of future CAP policies and Portuguese transition arrangements; and analyses of the influences of Portugal's macroeconomic policies on agricultural costs and returns.

Even more important, the research results of this study complement project analysis by narrowing the range of public investments that is likely

to be judged acceptable by Portuguese planners and decisionmakers. The period of projections, 1986–96, spans the critical years for prospective public projects; some investments surely will be amortized over longer periods, but their profitability will be influenced heavily by costs and returns in the first decade of each project's life. The basic results show the likely future efficiency of selected agricultural systems under a range of plausible assumptions.

Several systems are projected to be highly inefficient because of some combination of agroclimatic limitations resulting in unproductive technologies, unfavorable CAP or Portuguese policies, and developments in the rest of the Portuguese economy that cause the costs of labor or capital in agriculture to change over time. The results show the extent to which public investments would need to reduce costs per unit in order to permit these systems to produce efficiently. If such cost-reducing technological changes seem unrealizable, public investment can be justified only as part of an effort to assist in the adjustment of farms—to alternative, more profitable crops, to pasture, or to forestland—or of farmers and farm laborers to off-farm employment.

Alternatively, for systems projected to produce efficiently within the CAP regime, successful public projects would increase profits (rather than decrease losses). Those already profitable systems should not be ranked according to their projected efficiency when public investment projects are identified. The ranking of such investments turns on their relative additions to efficiency, not on the prior levels of efficiency. This book's results, therefore, provide guidelines to shorten the list of possible candidates for public investment. But this research does not substitute for detailed benefit-cost analysis of projects that enhance technical change and reduce costs in already efficient or close to efficient systems.

Facilitation of Technical and Structural Change

If policymakers are to help offset the adverse changes in farm income projected in this book, the principal option involves efforts to increase dramatically the rate of technical and structural change in the major crops and livestock products. Investments in the marketing of fruits, vegetables, and wine could increase somewhat the cultivated area in these crops. Irrigated crops (rice and tomatoes) could be expanded as well; the Ministry of Agriculture plans to triple the current irrigated area in the Alentejo and the Ribatejo. But competition from other EC countries will be severe for most of these commodities, and such expansion would absorb only a small share of the resources now committed to grain, milk, and meat production. Attempts to increase credit subsidies appear unlikely given government budget constraints and the administrative prob-

lems inherent in monitoring and implementing a targeted subsidy program. Some increases in income transfers to farmers might be achieved through the application of the EC's Hilly Areas Directive. However, budget constraints (both EC and domestic) will be likely to limit the magnitude of transfers to a small fraction of the amount needed to offset the projected declines in private profitability.

In part, the facilitation of technical change is beyond the control of agricultural policy. Growth in nonagricultural activity is essential to allow a reduction in the agricultural labor force and a consequent increase in the amount of nonlabor inputs per farm. Nonagricultural growth will depend on domestic industrialization policies that govern wages and employment, access to and cost of credit, and foreign investment. External growth and consequent demand for Portuguese exports will be important factors as well, because trade represents nearly one-third of national income.

The rate and pattern of technical change in agriculture, however, will depend principally on policies that can be influenced heavily by agricultural policymakers. Of foremost importance is the reorganization and expansion of research and extension capacity. The areas of greatest concern are the small farms in the Northwest and the poor-soil areas of the Alentejo, but much of the potential for technical change in these regions has yet to be determined. In many instances, policymakers have not yet identified the real constraints on production.

The impacts of research and development programs often are felt after a considerable time lag, and their influence on projected events might be quite limited by 1996. A more immediate impact, especially in the Northwest, could be derived from structural change through the reformulation of land policy. Restrictions on land rents are largely superfluous because the potential for tenant exploitation has been reduced relative to that in the pre-Revolution years. Attempts to regulate sales of land according to legislated minimums for parcel size are inappropriate because the legislated sizes are much larger than necessary to achieve current economies of scale in production. Although fragmentation remains a concern for numerous farmers and many parcels are so small as to prevent mechanization, the land market appears to be fully capable of reflecting these disadvantages. Rather than restricting transactions, policymakers need to introduce legislation that facilitates transfers, perhaps through recognition of real estate valuation procedures and a more direct involvement of the banks as lienholders in the event of spontaneous exchanges of land among farmers. Other alternatives include land consolidation and credit programs, although past success with these programs has been very limited. Like the development of technology, the design of structural adjustment policies to overcome factor market failure requires further research.

Summary and Conclusion

Portugal will lose control of its agricultural price policy during the ten-year period of transition to full CAP policy. A practical strategy for Portuguese agricultural development will have to rely on judicious use of public investment funds for agricultural infrastructure and research, complemented by factor policy changes that permit farmers to have easier access to land and credit. Projections of the competitiveness of thirty-three commodity systems indicate that pressures for adjustment will be significant in two regions—the Alentejo (on the cereal and livestock producing farms using poor soils) and the Northwest (on the dominant small farms producing milk, corn, wine, and potatoes). Levels of agricultural activity can be expected to decline in these two regions unless cost-reducing investments in new (and as yet largely undiscovered) technologies can improve profitability substantially. Structural adjustment in the Northwest appears likely to become a major area for policy attention. The availability of investment funds from the EC greatly increases levels of public resources for agricultural investment. The most critical and difficult dimension of agricultural policy currently confronting Portuguese decisionmakers is that of balancing the distribution of investment funds between projects aimed at increasing the productivity of already efficient systems and projects intended to ease the adjustment pressures in declining activities.

Although most of Portuguese agriculture is less productive and less advanced technically than agriculture in the other EC countries, the sector is far from stagnant. The growth of dairy and white *vinho verde* production in the Northwest, the development of improved pasture-based systems of meat production in the Alentejo, and the expansion of efficient large farms in the Ribatejo attest to the presence of a farm population that is highly interested in technical and structural change and increased efficiency. But the great tragedy for Portuguese farmers is that the government has been either unwilling or unable to facilitate adequate change. To the pre-Revolution regime, the availability of cheap, unskilled agricultural labor was critical for rapid industrialization, and research-induced increases in farm productivity were anathema. Subsequent governments have been much more sympathetic to agricultural producers, but often they too have been ineffective in facilitating change. Many policies intended to help small farmers have failed: rent controls have served mainly to constrain the potential availability of land to small-scale farmers; credit subsidies have entailed such high transaction costs that only larger farmers can use them; and limitations on use of credit for land purchase have meant that only farmers with access to informal sources of finance can buy land.

Projections of the likely impact of CAP prices on profitability set a distressingly difficult agenda for Portuguese agriculture. Without radical changes in technology, the Northwest will become characterized increasingly by poor, part-time farmers, and much of the farm area in the poor-soil parts of the Alentejo eventually could go out of agricultural production. Avoidance of these results requires radical changes in policies, from those that simply increase farm incomes through transfers to those that generate increased output and income through the development of more efficient production methods. Significant levels of investment funds and structural aids are available with EC membership. But the time for change is growing short.

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