HORTICULTURAL TRADE PATTERNS IN AN EXPANDED EUROPEAN COMMUNITY AND THEIR EFFECTS ON DEVELOPING COUNTRIES

CPD Discussion Paper No. 1984-29
September 1984

CPD Discussion Papers report on work in progress and are circulated for Bank staff use to stimulate discussion and comment. The views and interpretations are those of the authors.
HORTICULTURAL TRADE PATTERNS IN AN EXPANDED EUROPEAN COMMUNITY
AND THEIR EFFECTS ON DEVELOPING COUNTRIES

CPD Discussion Paper No. 1984--
September 1984

This discussion paper provides an initial summary of work undertaken under RPO 672-33, supervised by Malcolm Bale, CPD. Principal researchers are Professor Reimar v. Alvensleben and colleagues, University of Hannover, and Dr. Claude Falgon, Roland Olivier Conseil, Paris. This paper is the summary document to be used at a symposium of the same name at the World Bank on October 2, 1984, and at FAO, Rome, October 17, 1984.
ABSTRACT


This paper is a summary of the results of a Research Project (622-33) of the same name and was prepared as a preliminary report on the project to be used at symposia at the World Bank on October 2, 1984 and at FAO, Rome, October 17, 1984.

The paper begins by putting in perspective the importance of the EC as a market for horticultural products and the development of this market over time. The contribution of the World Bank to fruit and vegetable projects located in the Mediterranean area and exporting to the EC is noted and the reason for the Bank's interest in understanding the dynamics and potential of the EC market is explained.

The paper continues by exploring the common agriculture policy of the EC, the changes likely to occur as a result of the southern enlargement of the EC, and the method used for estimating the effects of enlargement. Results indicate that EC and world prices will fall as the southern countries become integrated into the EC. Products experiencing the greatest price decline will be cucumbers, zucchini, eggplants, artichokes, apricots, peaches, olive oil, and wine. The report concludes by studying the effects of these changes on a specific country -- Tunisia. While many products will be much more difficult to market in the EC such as olive oil, wine, and some fresh vegetables, Tunisia does have certain products and "market niches" such as maltase oranges, dates, and apricots which will be unaffected by the EC expansion and where increased exports to the EC will be possible.
# Table of Contents

I. Introduction and Background ............................................. 1

   Introduction ................................................................. 1
   The Development of Horticultural Trade ................................. 2
   The European Community's Trading System .............................. 3
   The Interest of the World Bank in this Work ........................... 4

II. Effects of the EC Enlargement on the Markets for Fruit and Vegetables ............................................. 5

   A. The EC Market Policy for Fruit and Vegetables: Policy Background ............................................. 6
   Prospective Policy Changes due to EC Enlargement ........................... 12

   B. Methodology ................................................................. 13

      Market Balances and Status-Quo Projections .......................... 14
      Status-Quo Projections to "1990" ......................................... 14
      Estimation of the "Enlargement Effects" ................................. 16
      Model Description .......................................................... 17
      Limitations of the Method ................................................ 18

   C. Main Results ................................................................. 20

III. Export Prospects for the Tunisian Fruit and Vegetable Subsector ............................................. 22

   Background ................................................................. 22

   Overview of Tunisian Agriculture ......................................... 22

   Fruit ................................................................. 30
   Vegetables ................................................................. 31
   Marketing ................................................................. 31
   Prices ................................................................. 31
   The Vegetable Model ........................................................ 31
   Tree Crops ................................................................. 36
   Vegetable Exports Prospects for Tunisia .................................. 36
   Fruit and Fruit Products Exports Prospects ............................... 39

      Apricots ................................................................. 39
      Citrus Fruit .............................................................. 40
      Almonds ................................................................. 40
      Dates ................................................................. 40
      Olive Oil ............................................................... 41
      Wine ................................................................. 42

   Planning and Policy Analysis with Sector Models .......................... 43

   A. Disaggregation ............................................................ 43

   B. Modeling Method ......................................................... 45

   C. Transferability .......................................................... 46
I. INTRODUCTION AND BACKGROUND

Introduction

On January 1, 1981, Greece became the tenth country to join the European Community (EC). Spain and Portugal have also applied for full EC membership, and negotiations are intermittently underway with an anticipated date of Spanish and Portuguese accession of 1986.

Agriculture and a common policy toward it have perhaps been the key bond holding the EC together. Hence, it is no surprise that agriculture has loomed large in the enlargement negotiations with Spain, Greece, and Portugal, given that the national product in these three countries depends much more on agriculture than it does in the current EC-9. Within agriculture, concern in the EC from enlargement has centered on the so-called Mediterranean or "southern" products (mainly fruit, vegetables, wine, and olive oil) in which the three new members clearly have a comparative advantage in production because of climatic conditions. The concern is that the protective umbrella of the Common Agricultural Policy (CAP) of the EC will induce large excess supplies of these products in the enlarged EC which might have an adverse impact on the producers of similar products in the EC-9.

Outside the EC, the concern regarding Mediterranean products has been different. The EC as a bloc is the single largest importer of fresh fruits and vegetables in the non-communist world, accounting for 55% of world fruit imports and 60% of world vegetable imports. It is therefore a vital market for fruit and vegetable exporting countries. While the EC is a major producer of fruit and vegetables (and even exports some), its horticultural industry is not expanding and its demand for horticultural imports largely reflects seasonal patterns of production. During the off-season the demand (as manifest by price) for fresh fruits and vegetables is great and growing. This growth is an income elasticity response reflecting a change in food habits away from the bulky, high-carbohydrate traditional winter vegetables such as turnips, potatoes and cabbage, toward fresh imported "choice" produce such as green beans, eggplants, zucchini, strawberries, and the like. Significant suppliers of these products, besides the new entrants, are the North African and Mediterranean countries. The concern in these countries is that they may lose a significant amount of their market as a result of the new EC membership.
One of these countries, Tunisia, like many other Mediterranean countries, is a net exporter of horticultural products to the EC. These products comprise a significant share of the value of its agricultural and total exports. The volume of horticultural exports amount to approximately 90% of agricultural exports and 17% of total exports. A variety of horticultural crops are grown for export, including tomatoes, cucumbers, sweet peppers, onions, potatoes, eggplant, carrots, asparagus, green beans, melons, citrus fruits, dates, olives, olive oil, table grapes and wine. A large (although declining) proportion of these is exported to the EC as a result of the historical trading ties that Tunisia has had with France.

The Development of Horticultural Trade

Over the last ten years horticultural products have become much more internationally traded due to technological and economic developments. Historically, most fruit and vegetables were consumed quite close to the areas where they were produced. The reasons for this were based on the characteristics of these products that make them difficult to trade: seasonal availability, wide price swings over the season, great variability in quality, and high perishability making transportation and storage difficult. Further, until recently only a small proportion of total produce was processed. These characteristics led to a predominant pattern of local production for regional markets, and the persistence of the wholesale market where produce physically passes from the producer to be bought on sight by the retailer.

However, a number of recent developments have increased the tradability of horticultural products. These changes can be classified as changes in the nature of the product and changes in the technology of production, processing, transportation and storage.

The physical nature of the product is changing, based on breeding, so that new varieties can better withstand transportation and storage. The best-known examples are probably the development of the iceberg lettuce and the paste tomato. Second, standardization and quality control for international trade in horticultural products are developing under the auspices of the OECD. As the homogeneity of the produce traded increases and grading becomes standardized, so produce can be traded on description alone. The demand for standardization has led to increasing use of intensive production techniques such as plastic greenhouses, irrigation, improved plant protection, and grading for size and quality of the produce.
The technology of transportation has also improved. Refrigerated containers for some fruit and vegetables can permit sea transport, and the greater availability and decreased real cost of air transport allow produce to be sold in markets hitherto thought to be inaccessible.

These trends must be seen in the light of the fact that production of horticultural crops is labor intensive and that production technology is mature and widely available. This implies that many developing countries with relatively cheap but skilled farm labor and natural climatic advantages are finding it increasingly attractive to produce increasing quantities of fruit and vegetables for export to industrial countries in both fresh and processed forms.

It is in the context of these wider developments that one must place the next enlargement of the EC. The inclusion of the three new members within the protective walls of the EC will make the enlarged EC much more self-sufficient in fruit and vegetable products and, hence, increase the difficulty of other Mediterranean exporters to expand supplies to the world's largest produce market to the north.

The European Community's Trading System

A central feature of the European Community trading regime is the Common Agricultural Policy (CAP). The CAP is an elaborate price-and-trade-regulating mechanism which supports and protects the EC agricultural sector. Domestic producer prices are supported at levels that generally exceed "world prices" and imports are regulated by tariffs and variable levies to ensure that the prices of domestically produced goods will not be undercut by imports. Most fruits and vegetables of significance to the EC and all olive products and wine are covered under various CAP regulations and more are added to the system over time.

The common customs tariffs are complex. They vary every year and in different seasons for each product. The general pattern is that they are higher during the periods of EC production and lower in off-season periods. They are described in further detail later.

In addition to the general aspects of CAP, the EC modifies its restricted market access somewhat to certain countries by negotiated bilateral agreements. These agreements confer varying reductions in tariffs and free some imports from variable levies, but in return all imports can be suspended in times of domestic EC "over-supply." These agreements have been made with
countries that have historical trading ties with at least one country of the EC (often former colonies) and are considered as exceptions to the spirit of CAP. But for horticultural exporters to the Community, the EC is a difficult market to penetrate. It is a "moving target" as regulations within the EC and membership of the EC evolve and change. This presents a problem to planners and policymakers of countries that supply products to the EC, because the market environment appears to be in a constant state of flux.

Therefore there is a need to understand two aspects of horticulture in an expanded European Community. First, when the new members become integrated into the EC how will horticultural trade be influenced? That is, how will current patterns of trade in horticultural products to and from the EC be changed by the inclusion of new Mediterranean members? There will be some trade diversion as horticultural products from the new members partially displace exports of certain third countries. There will be a trade-creation effect in that the new members will supply a greater share of the existing EC market. World prices for horticultural products may decline because of smaller trade to the EC. On the other hand, in a dynamic context, growth in income in the EC, which will cause consumption of fruit and vegetables to increase, may dominate the price effect. This project attempts to quantify some of these aspects of trade.

The second part concerns the specific effects of accession on Tunisia, a country dependent on horticultural exports to the Community. This study responds to the question of what quantities of what exports will be displaced by expansion of the EC, and what effects will this have on Tunisian horticulture. Are the market possibilities such that it is possible to recommend that the potential for increased horticultural production in Tunisia be exploited?

The Interest of the World Bank in This Work

The World Bank made loans amounting to US$15.5 billion in fiscal 1984, growing at a rate of nearly 14% per year. Approximately 25-30% of World Bank loans go to agriculture and rural development, of which nearly 40% have a significant fruit and vegetable component. Thus in recent years the World Bank has invested approximately US$1.5 billion per year in fruit and vegetable projects.

In World Bank projects there has been a concentration on off-season production, often in greenhouses, aimed at the high-demand off-season produce
markets of industrial countries. With respect to the geographical distribution of fruit and vegetable products, there has been a marked concentration of resources going to develop the horticultural sector of most Mediterranean-rim countries and several fruit-tree development and rehabilitation projects in Eastern European Countries. The major part of output from these exports is destined for export and the major destination of these exports is the EC. Thus projects appraised under the assumption that current trading conditions and opportunities would remain constant now appear less viable. Accordingly, it is essential that the World Bank obtain a better understanding of the environment faced by its client countries in the area of fruit and vegetable production and trade.

Consequently, this work had several aims to assist the World Bank in its work.

First, can the current EC treatment of external trade in fruits and vegetables be described in a way that makes it more transparent to policymakers in the Bank and in third countries.

Second, what changes in international trading patterns of fruits and vegetables are likely to arise as a result of the southern expansion of the EC.

Third, what effects are these changes likely to have on a specific country, Tunisia, and how useful are sectoral modeling efforts for policymaking in this context.

The following pages present in summary form the results of this work.

II. EFFECTS OF THE EC ENLARGEMENT ON THE MARKETS FOR FRUIT AND VEGETABLES

Up to now the prospective effects of the EC enlargement have been assessed in general qualitative terms or on a very aggregate level. This study tries to quantify the prospective effects of the EC enlargement with special emphasis on the product diversity and seasonality of the fruit and vegetable sector.

The problem is of considerable relevance for developing countries. Many agricultural development projects, especially in the Mediterranean basin, contain an important fruit and vegetable component. Often the output of these projects is destined for export to the European Markets, the EC being the world's major importer of fresh fruit and vegetables.
The results of the study should reduce the uncertainty about long-term price expectations for suppliers of Mediterranean products. It should assist policymakers inside and outside the European Community in planning future production strategies and policies, and should be of assistance in providing a source of unbiased economic information for the various trade negotiations that the southern expansion of the EC implies.

A. The EC Market Policy for Fruit and Vegetables: Policy Background

The European Common Market was founded in 1962 by six member states: Belgium, France, Germany (F.R.), Italy, Luxembourg and the Netherlands. In 1973, Denmark, Ireland and the United Kingdom joined the Common Market. In 1981, the second enlargement started with the entry of Greece. The market policy of Greece will be harmonized within a transition period of five to seven years. After the planned accession of Portugal and Spain the EC will consist of twelve member states.

The major goals of the EC market policy are to stabilize and improve grower incomes, provide food supply at reasonable prices, avoid trade conflicts with third countries, and reduce state expenditure for market policy. The foreign trade with third countries is regulated by several instruments:

1. Tariffs
2. Reference price system
3. Quantitative restrictions
4. Quality norms
5. Export rebates

1. Tariffs. Within the EC countries tariffs have been abolished as is characteristic of a customs union. Imports from third countries are subject to tariffs, which are differentiated by products, seasons and countries of origin. Deliveries from ACP countries are, in general, duty free according to the Lome Convention. Most of the Mediterranean countries have negotiated preference tariffs. During the EC production season the ad-valorem tariffs are generally higher than in the off-season. Detailed information about the tariff structure of the European Community are given in the product sections.

2. Reference Price System. Reference prices, which are differentiated by season and quality standards, are applied to the following products and periods:
Tomatoes  
April 1 to December 20
Cucumbers  
February 11 to November 10
Apples  
July 1 to June 30
Pears  
July 1 to April 30
Peaches  
June 11 to September 30
Plums  
June 11 to October 20
Mandarins  
November 1 to February 29
Oranges (sweet)  
December 1 to May 31
Lemons  
June 1 to May 31
Table grapes  
July 11 to November 20
Eggplant  
June 21 to October 31
Zucchini  
April 21 to September 30

Products are added to the list all the time. For example, in October 1983, the minister's council decided to add apricots, lettuce, endive and artichokes to the list. The grower's associations of the EC are demanding the addition of asparagus, sweet pepper, mushrooms, onions, cauliflower, melons, green beans and early carrots. In 1984, the period of application of the reference price system for eggplants was extended from April 1 to October.

The decision on the level of the reference prices is made yearly in the course of the price negotiations in EC minister's council. The system functions as follows: on every market day the import prices (reduced by import duties and levies) of products from third countries are determined at the importer/wholesaler stage on certain representative markets in the EC. The importer has to pay the difference between the reference and import price (a countervailing charge), when

a. the import price remains at least 0.6 ECU per 100 kg under the reference price for two consecutive days, or

b. the import prices stay alternatively above and below the reference price for five of seven days.

Through this mechanism the market price cannot fall short of the reference price level as a consequence of imports from third countries. Countervailing charges usually reach a prohibitive level when the import
prices remain under the reference price for several days, since the import price is determined by deducting the import duty and the countervailing charge of the preceding period from the market price.

The system has given an incentive to the export countries to control the export supply to the EC in such a way that countervailing charges are avoided as far as possible. For instance Spain has introduced a quota system for its exports to the EC.

The reference price system has been applied to cucumbers and tomatoes frequently, to plums, peaches and table grapes less frequently, and rarely to apples, pears, cherries and citrus fruits. About 50 to 60% of the total EC-9 supply of fruit and vegetables for the fresh market is protected by the reference price system (vegetables 20%, fruit 90%).

2. **Quantitative Import Restrictions.** Import restrictions can be applied in the case of serious market disruptions caused by imports on the basis of a safeguard clause. This instrument is used only infrequently. In addition, voluntary export restraints have been negotiated with exporting countries (mainly for apples from the southern hemisphere). Further import restrictions can be enforced by single member states (Art. 22 of EC Regulation 1035/72) for a limited list of products.

3. **Quality Norms.** Only products which meet the EC quality standards are allowed to be imported into the EC. This regulation has not caused serious trade restrictions since competition demands only high quality products in the EC.

4. **Export rebates.** For most products in the reference price system, and for nuts, variable export rebates are given to exporters to bridge the price differences between the EC and the world market. In 1981 about 60 million ECU's have been appropriated for this measure in the EC budget.

In addition to the foreign trade regulations the EC has established a price support system on the internal market. The main instruments are an intervention system and subsidies for citrus fruits.

1. **Intervention system.** The following products and periods are covered by the intervention system:

   - **cauliflower** the whole year
   - **tomatoes** June 10 to November 30
   - **apples** August 1 to May 31
pears            July 1 to April 30
peaches          June 1 to September 30
table grapes     August 1 to October 31
mandarins        November 16 to February 29
oranges (sweet)  December 1 to May 31
lemons           the whole year
Since 1982:
apricots         June 1 to July 31
eggplants        July 1 to October 31

It seems likely that this list will be supplemented with additional products in the future. Up to now approximately 50-60% of the total EC supply of fruit and vegetables for the fresh market is covered by the system (vegetables 20-25%, fruit 80-90%).

The intervention price level is derived from the so-called basic price, which should be equal to an average market price and is fixed in the course of the yearly price negotiations taking account of the development of prices and costs in the three preceding years.

The government authorities are obliged to intervene in the market at the level of the buying-in-price, which is fixed at:

40-45% of the basic price for cauliflower, tomatoes, eggplants
50-55% of the basic price for apples and pears
60-70% of the basic price for citrus fruits, table grapes, peaches and apricots.

Producer organizations have the right to withdraw produce from the market at the withdrawal price, which can exceed the buying-in-price by at most ten percent of the basic price. In recent years only producer organizations (not the state) have intervened in the market. The costs are refunded by the EC guarantee fund.

In the average of the three years 1979-80 to 1981-82, 950,000 tons (4.1% of the market production) of fresh fruit and vegetables have been withdrawn from the market. The budget costs of this measure amounted to 118 million ECUs per year. Apples accounted for 28% of these costs, citrus fruits for 27%, peaches for 28%, pears for 9%, tomatoes for 7% and
cauliflower for 1%. More than 90% of the intervention costs were caused by withdrawals of perennial fruit crops. In 1982-83, the market withdrawals reached a record figure of about 1.4 million tons.

2. Subsidies for citrus fruits. To reduce the withdrawals of citrus fruits, oranges, mandarins, clementines and lemons of EC origin are subsidized by market penetration premiums (EC Regulation 2511/69) and processing premiums (EC Regulation 2601/69 and 1035/77). At the same time the reference prices have been frozen at the level of 1975. This is the main reason why countervailing levies for citrus imports have remained unchanged in most cases. The budget cost for these subsidies was 72 million ECU’s in 1981. The subsidies for lemons and clementines will be gradually abolished between 1983-84 and 1986-87 and a corresponding rise of the reference prices will occur. A similar adjustment is planned for oranges and mandarines in the period between 1990-91 and 1993-94. This change of the EC citrus policy has been decided probably in view of the increased degree of self-sufficiency in the EC citrus market when Spain joins the EC.

Foreign trade regulations for Processed Fruit and Vegetables. On the market for processed fruit and vegetables the following foreign trade regulations are applied:

- Import tariffs (e.g. tomatoes 18%, asparagus 22%, peas and green beans 24%, peaches 22%, pears 20%);

- Variable import levies and export rebates on the sugar content to counterbalance the difference between world price and EEC price for sugar;

- Import licenses. The importer has to post a bond which is forfeited if the import has not crossed the border within a given time period. This regulation is applied to tomato concentrates, peeled tomatoes, tomato juice, canned mushrooms, peas, green beans, raspberries, pears, peaches, dried plums;

- Import embargoes or import quotas in the case of serious market disruptions (application of the safeguard clause). Up to now these measures have applied only to canned mushrooms;

- Voluntary export restrictions (canned mushrooms);

- Export rebates for products not receiving production subsidies.

In the EC budget of 1981 about 10 million ECU’s have been appropriated for export rebates for processed fruit and vegetables.
Production subsidies for Processed Fruit and Vegetables. Based on the EC Regulation 1152-78, production subsidies are given for the following products:

Since 1978:
- tomato concentrates
- peeled whole tomatoes
- tomato juice (3.5 - 7%)
- peaches in syrup
- dried plums

Since 1979:
- peeled sliced tomatoes
- tomato juice (7 - 12%)
- peeled frozen tomatoes
- tomato flakes
- Williams pears in syrup

Since 1980:
- Sweet and sour cherries in syrup

Since 1981:
- Dried figs, sultanas, currants

The subsidy is paid to the processing companies provided that they contract with the growers for the delivery of the products at minimum prices fixed by the EC authorities. To control the supply response to the subsidy a quota system has been introduced gradually for some products:

Since 1979:
- Williams pears

Since 1980:
- Cherries

Since 1982:
- Tomatoes

Since 1984:
- Sultanas, currants

The amount of the subsidy is considerable. It is based on the value of the raw products before the introduction of the subsidy system and it has generated a large production response.

In 1982, the expenditure on this measure was 550 million ECU's. In 1983, 718 million ECU's were allocated for the subsidy. A large proportion of this amount was spent for tomatoes.

At present about 30% of the EC production of processed fruit receives a production subsidy. Not included are products such as plums in syrup, apricots, mandarins, berry fruit, applesauce, mixed fruit and other processed
fruit and vegetables such as fruit juice, jams, other dried fruits and processed vegetables (except tomatoes).

**Prospective Policy Changes due to EC Enlargement**

As in the case of Greece, the entry of Spain and Portugal into the Common Market means removal of the present trade restrictions between the EC and the new member states, and the substitution of present policies of the new member states by the EC market regulations. The essential policy changes are:

1. Introduction of the EC intervention system in the new member states
2. Introduction of the producer subsidy system for processed fruit and vegetables in the new member states
3. Abolition of the reference price system imposed by the EC on imports from the new member states
4. Abolition of the safeguard clause and of national import restrictions imposed on these countries
5. Abolition of the EC-tariffs imposed on imports from these countries (This measure is of importance mainly for Spain as Greece enjoyed zero-tariffs before entry into the EC and imports of fresh fruit and vegetables from Portugal are negligible.)
6. Introduction of the EC rebates for exports to third countries in the new member states.

The average tariff burden on EC-imports from Spain is given in Table 1.

Since the EC enlargement will increase the relative weight of Mediterranean products within the European Community, it is likely that the EC enlargement will result in more protection for Mediterranean products by supplementing the list of products under the intervention-, reference price- and production-subsidy system or by widening the periods of its application. However, at present it is not possible to predict the size or type of policy changes.

As far as the transition period is concerned, Greece entered the Community in 1981 and will adopt the EC market regulations within five years, except for tomatoes and peaches where it was agreed the transition period would be seven years.
Table 1: Tariff Burden on EC Imports of Fresh Fruit and Vegetables from Spain, 1982

<table>
<thead>
<tr>
<th>Position</th>
<th>Fresh vegetable</th>
<th>Fresh fruit (without citrus)</th>
<th>Fresh citrus fruit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume (1,000 tons)</td>
<td>881</td>
<td>346</td>
<td>1,581</td>
<td>2,808</td>
</tr>
<tr>
<td>Value (million ECU)</td>
<td>401</td>
<td>272</td>
<td>584</td>
<td>1,257</td>
</tr>
<tr>
<td>Paid tariffs (million ECU)</td>
<td>44.5</td>
<td>34.1</td>
<td>62.1</td>
<td>140.7</td>
</tr>
<tr>
<td>Average tariffs (% ad valorem)</td>
<td>11.1</td>
<td>12.5</td>
<td>10.6</td>
<td>11.2</td>
</tr>
</tbody>
</table>

For Spain and Portugal, the European Community has proposed a transition period of ten years beginning in 1986. The tariffs between the EC, Spain and Portugal shall be removed during this period at a rate of 10% per year. For sensitive products like fruit and vegetables, the transition period shall consist of two subperiods. During the first period of four years the EC market policies shall remain unchanged (except for the tariff reductions). In the second period of six years the stepwise introduction of the intervention and production subsidy system and the removal of the EC import restrictions is planned. However, the EC intends to introduce at the same time an import surveillance system to prevent an extraordinary increase of imports from the new member states. Spain has rejected these proposals and as of this writing the final results of the negotiations cannot be foreseen.

B. Methodology

Policy implications are analyzed in this study by comparing the results of two different projections. First, status-quo projections of supply, demand and prices to "1990," to show the market trends without EC enlargement, are calculated. Second, model calculations to estimate the "enlargement effect" on equilibrium prices and quantities are made.
These two steps are shown in a schematic way in Figure 1, in which Spain represents the applicant countries and the EC-9 represents all other countries.

**Market Balances and Status-Quo Projections**

The first step is the calculation of seasonal market balances for those countries or regions which are relevant for the West European market. The data on which this is based are

- The EC trade statistics (monthly data)
- Other import/export statistics of different countries on a monthly basis (where available)
- Information on the production and consumption season in different countries

Major problems were encountered with respect to the availability and reliability of data, the regional delimitation of the market, and the seasonal delimitation of the market.

The balances are calculated for "1980." The figures are either trend values or an average of two or three years.

**Status-Quo Projections to "1990"**

Supply and demand balances. The supply and demand balances have been projected to "1990" to show the market development without EC enlargement. The methods used have been trend extrapolations, sometimes adjusted by an "informed judgement" to balance supply and demand.

The availability and reliability of seasonal time series data, the choice of the base period and of the function type have been problems that needed to be solved. A further difficulty that needed to be assessed concerned whether the factors which have determined the trend in the past, are relevant in the future.

Consequently, the projections should be regarded as providing information on the direction and order of magnitude of change rather than precise information on the actual change of prices and volumes. However, sensitivity analysis of projected supply and demand used to estimate the "enlargement effects," showed that variations in the projected quantities had only marginal effects on the model results.
Figure 1:

EFFECT OF THE EC-ENLARGEMENT ON THE MARKET EQUILIBRIUM IN THE EC-9 AND SPAIN (SCHEMATIC)

EC-9          SPAIN

OBSERVED PROJECTION       OBSERVED PROJECTION

↑ PRICES     ↓

AFTER WITHOUT EC-ENLARGEMENT

↑ SUPPLY     ↓

AFTER WITHOUT EC-ENLARGEMENT

↑ DEMAND     ↓

WITOUT AFTER EC-ENLARGEMENT

↑↓ ENLARGEMENT EFFECT
Prices. The status-quo projections of seasonal prices to "1990" are carried out to obtain a benchmark against which the price effects of the EC enlargement can be compared. Most of the prices are unit values taken from German import statistics. This method has serious shortcomings since the imported assortment and the qualities may change over time causing a bias in the time series. However, this is the best set of consistent price information that is available.

Nominal prices have been deflated by the general price index of the currency. As a result the observed and projected real price series are influenced by fluctuations in the exchange rates of the relevant currencies.

Trends are calculated as linear and logarithmic regression functions. The price series and the extrapolation of the trend functions are presented in graphs in the appendix. Additional information is the average rate of change in price from the base period.

Estimation of the "Enlargement Effects"

When the EC import restrictions against Greece, Spain and Portugal are removed the following reactions will occur in fruits and vegetables:

**In Applicant countries (mainly Spain):**

- An increase in prices (both producer and consumer)
- An increase in production
- A decrease in domestic consumption
- An increase in exports

**In EC-countries:**

- A decrease in prices (due to more imports from Spain)
- A decrease in domestic production
- An increase in consumption
- An increase in imports or a decrease in exports

**In Third countries**

- A decrease in prices (due to increased competition from the applicant countries)
- A decrease in production
- An increase in domestic consumption
- A decrease in exports to the EC and an increase in exports to non-EC-countries

The intensity of these reactions depends on several factors:
- The degree of protection against the applicant countries before the EC-enlargement
- The relative importance of production and consumption in the applicant countries with respect to the relevant international markets. The higher the present market share of the applicant countries the stronger will be the price decline on the international markets
- The price elasticities of supply and demand.

Since these factors vary greatly by product and season, a disaggregated analysis taking account of product and seasonal differences is necessary. Further, the differential effects of the intervention system, of production subsidies, production quotas, export/import limitations and minimum prices by product must be considered.

Model Description

To calculate the "enlargement effects" a comparative static multi-regional market equilibrium model has been used. 1/

Independent variables of the model are:

- supply in each country/region
- demand in each country/region
- price (index) in each country/region
- price elasticities of supply and demand (assuming functions with constant elasticities)
- Policy parameters:
  - tariffs
  - subsidies

---

- tariff equivalent of the reference price system
- intervention demand (assumed to be a sloped function of the equilibrium price)
- quantitative restrictions (supply quotas, export or import limitations)
- minimum prices

Dependent variables are:
- new equilibrium prices
- new equilibrium quantities (showing the net exports and imports of each country/region)
- intervention quantities

The mathematical formulation of the model is shown in Figure 2. The equations are solved by an iterative procedure. The computer program has been written in Fortran and in Basic and can be used on a microcomputer. 1/ The model calculates the change in equilibrium prices and quantities which result from a variation of the independent variables. The effect of the EC enlargement is calculated by a variation of the policy parameters such as the removal of tariffs imposed on imports from the new member states.

**Limitations of the Method**

The results of the model calculations show the possible dimensions of price and quantity changes resulting from enlargement of the EC. Together with the status-quo projections the results should be useful to planners and policymakers involved in decisions regarding Mediterranean products. However, there are certain limitations that should be taken in account before using the results in a literal way.

1. The calculations are comparative static ones. The necessary adjustment process is not considered explicitly, but rather a "snapshot" is taken of 1990 with and without the accession of the southern members. Especially in the case of perennial crops, the adjustment process may extend beyond

1/ The program was developed by J. Schaps, Institute for Agricultural Economics, University of Goettingen.
FIGURE 2: THE MARKET EQUILIBRIUM MODEL (BASIC VERSION)

1. Aggregate supply function

$$\sum_{k=1}^{n} x_k = a_k p_{x_k}$$

2. Aggregate demand function

$$\sum_{k=1}^{n} y_k = d_k p_{y_k}$$

3. Market equilibrium

$$\sum_{k=1}^{n} x_k = \sum_{k=1}^{n} y_k$$

4. Relation between supply price and demand price

$$p_{x_k} = p_{y_k} + s_k$$

5. Relation between price in country k and price in country l

$$p_{x_k} = \frac{p_{x_l}}{1 + t_k} + s_k$$

Explanation of the symbols used:

- $x_k$: Supply in country k
- $a_k$: Parameter of supply function in country k
- $p_{x_k}$: Supply price in country k (wholesale level)
- $b_k$: Price elasticity of supply in country k
- $y_k$: Demand in country k
- $d_k$: Parameter of demand function in country k
- $p_{y_k}$: Demand price in country k (wholesale level)
- $e_k$: Price elasticity of demand in country k
- $s_k$: Subsidy in country k
- $p_{x_l}$: Supply price in country l (EC-9)
- $t_k$: EC- ad valorem tariff against country k
- $n$: Number of countries
the year 2000. At present the EC is planning a transition period of ten years for the entry of Spain and Portugal, ending in 1996.

2. Due to the partial character of the model, substitution and complementary effects between different product markets and between different seasons have been neglected. In addition perfect substitution between similar products from different countries is assumed.

3. The model considers only "enlargement effects" as far as they are caused by the removal of the trade restrictions and the introduction of the EC market regulations in the new member states. Other integration effects resulting from structural policies and the general economic policies, which may lead to more direct support of the agricultural sector and to an increased economic growth in the new member states, have been neglected.

4. The data used as model input has often been deficient. In many cases poor information has been complemented by the "informed judgement" of the analysts.

C. Main Results

The EC enlargement, especially the entry of Spain into the EC, will cause a general decline of prices on the international fruit and vegetable markets. However, these price effects vary considerably by product and season.

The price reductions obtained from the model move between the following ranges, depending on the assumptions made (Table 2).

In examining the price effects recall that this product list contains those items which are most sensitive to the EC enlargement, and that those seasons in which a measurable impact of the EC enlargement is not expected have been excluded. It should also be noted that the negative price effects will hit the fruit and vegetable sector both inside and outside the European Community. Especially Spain will gain market shares on the expense of all other countries which are supplying the European market.

In general the price reductions caused by the EC enlargement exacerbate a general negative trend of real prices which is occurring on international markets for fruit and vegetables. Compared with the secular price decline over one decade, the price reductions caused by the EC enlargement are of second-order importance. But for planning purposes, both effects—the general trend and the "enlargement effect" on the prices—must be considered.
### Table 2: PROJECTED RANGE OF PRICE REDUCTIONS

<table>
<thead>
<tr>
<th>Annual Crops</th>
<th>Range (in percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>tomatoes (fresh)</td>
<td>-3</td>
</tr>
<tr>
<td>cucumbers</td>
<td>-0.5</td>
</tr>
<tr>
<td>sweet pepper</td>
<td>-2.3</td>
</tr>
<tr>
<td>onions</td>
<td>-3.8</td>
</tr>
<tr>
<td>zucchini</td>
<td>-4.0</td>
</tr>
<tr>
<td>eggplants</td>
<td>-2.1</td>
</tr>
<tr>
<td>artichokes</td>
<td>-0.2</td>
</tr>
<tr>
<td>early potatoes</td>
<td>-0.5</td>
</tr>
<tr>
<td>watermelons</td>
<td>-0.4</td>
</tr>
<tr>
<td>other melons</td>
<td>0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tree Crops</th>
<th>Range (in percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>apricots</td>
<td>-0.8</td>
</tr>
<tr>
<td>table grapes</td>
<td>-3.9</td>
</tr>
<tr>
<td>oranges</td>
<td>-0.0</td>
</tr>
<tr>
<td>tangerines</td>
<td>-2.0</td>
</tr>
<tr>
<td>sweet almonds</td>
<td>-1.2</td>
</tr>
<tr>
<td>sultanas</td>
<td>-0.6</td>
</tr>
<tr>
<td>dried figs</td>
<td>-4.7</td>
</tr>
<tr>
<td>lemons (fresh)</td>
<td>-0.6</td>
</tr>
<tr>
<td>peaches (fresh)</td>
<td>-0.3</td>
</tr>
<tr>
<td>strawberries</td>
<td>-0.3</td>
</tr>
</tbody>
</table>
III. EXPORT PROSPECTS FOR THE TUNISIAN FRUIT AND VEGETABLE SUBSECTOR

Background

The objectives of this part of the research project were first to estimate the impact of an expanded EC on the fruit and vegetable sector of a nonmember Mediterranean country, and Tunisia was selected as a case study, and second to test the feasibility of using various modeling techniques to perform this analysis which requires a detailed definition of products, accounting for quality and period of production. Modeling techniques used before have not used such a detailed specification as here where quality and period of production are separately defined.

Overview of Tunisian Agriculture

Agriculture's share of GDP has decreased from 24% in 1972 to 15% in 1980, due to the rapid expansion of other sectors, especially industry and tourism. About 47% of the total Tunisian population (estimated at about 6.6 million) lives in rural areas and 35% of the total active population is employed in agriculture. Agriculture's share of total investment (private and public) has remained constant at about 14%. Its share in government's total expenditure has averaged 10%.

There are five major agricultural regions in the country. The North West is the main grain producing region. Traditional farming is predominant in Kroumirie and Mogod areas, whereas mechanized farming on large units is typical of the upper Mejerdha valley and the Beja area as well as, more recently, in the Kef and Siliana region. Perennial crops tend to be located mainly on hillsides.

The North East is a region of mixed-farming whose economy is influenced by the large market of Tunis. Irrigation development in the lower valley of Medjerda and in the Bizerta area has allowed increased production of vegetable crops. The Cap Bon is the major production area for citrus fruits (82% of the area), grapes and wine. It is also a traditional center for vegetable production. Underground water availability has, however, limited the development and intensification of these productions.

The Sahel Region is a coastal strip located between Nabeul and Sfax and is known as a traditional center for fruit trees and, more specifically, for olive oil production. In the northern part, irrigated perennial crops
tend to be replaced near the coast by vegetables, especially off-season under
green houses and tunnels; olive oil production is decreasing and old planta-
tions tend not to be replaced. In the southern part, near Mahdia, vegetable
production, and intensive and extensive olive oil production cohabitate.

In the Center Region, tree crops and extensive animal husbandry pre-
dominate. The plain of Sfax produces 30% of Tunisian almonds and 40% of olive
oil. In the plain of Kairouan, tree-crop plantations (especially olive,
almond and apricot trees) replace progressively the steppe, encouraged through
development programs. However, extensive sheep raising remains the main
activity.

Finally, the South is a semi-desert to desert region. Except in
Jerba and Zarsis, where rainfed olive trees have been developed, agriculture
is only made possible through irrigation. In the oases, especially near
Tozeur, are produced highly demanded dates. The development of new date-palm
plantations is, however, difficult because of the lack of water resources.

The farm structure in Tunisia is such that in 1980, about 80% of the
total tillable land area (5 million) was privately owned. Cooperative produc-
tion units accounted for only 234,000 ha and Agro-Combinats (State farms)
accounted for 213,000 ha. The number of farmers was estimated at 355,000.
Average farm size was 14 ha and 42% of farms were less than 5 ha. In the
northern region, this percentage increases to 53.

In 1980, total cultivated area was 3.7 million ha composed of:
- cereals: 1,339,000 ha (36% and 58% in northern governorates)
- pasture: 253,000 ha (7%)
- pulses: 162,000 ha (4% and 94% in northern governorates)
- tree-crops: 1,816,000 ha (50% and 86% in southern governorates)
- vegetables: 95,000 ha (3%)
- industrial crops: 11,000 ha (0.3%)

Total irrigated area is 156,200 ha. More than half of the irrigation water
comes mainly from surface wells.

Crops account for the major part of total agricultural production.
Main productions are grains (1,165,000 tons in 1980, out of which durum wheat
represents 740,000 tons), vegetables (1,125,000 tons), fruits (940,000 tons)
including olives (425,000 tons) and citrus fruits (220,000 tons).
Animal production is almost evenly distributed between beef (34,700 tons), poultry (41,500 tons) and sheep (32,800 tons). Egg production amounts to 725 millions units and milk production is 245,000 tons.

Fruit

Tree crops cover about 50% of the cultivated area and account for more than 30% of agricultural production. More than 50% of the farms produce fruit. Olive trees are by far the most important tree crop with more than 70% of the planted area. However, the economic importance of other tree crops (citrus fruit, dates, grapes, almonds, apricots) is proportionally higher than indicated by area planted.

Vegetables

In 1980, the total area in vegetables was estimated at 105,000 ha. The most important region is the northeast representing 47% of the total. The central west region is the second in importance, accounting for 26%. Northeast and central east regions account respectively for 12% and 11% of the total vegetable area while the remainder comes from oases production in the south.

Of the total irrigable area in Tunisia of 225,700 ha, 47% is devoted to vegetable crops and 34% is devoted to tree crops.

Greenhouses and small plastic tunnels represent a total area of 215 ha and 895 ha, respectively and are mainly located in the central coast region near Monastir and Sfax. Greenhouses and tunnels produce off-season products of high quality, mainly oriented towards the Tunis market and recently towards the export market.

The area on which open-field off-season production is performed is limited to 2,036 ha. The most important zones are located in the Nabeul and Souss governorates.

In 1980 the area and output of vegetable production was distributed as follows:

<table>
<thead>
<tr>
<th></th>
<th>Area (hectares)</th>
<th>Production (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>tomatoes</td>
<td>17,170</td>
<td>300,000</td>
</tr>
<tr>
<td>potatoes</td>
<td>15,530</td>
<td>130,000</td>
</tr>
<tr>
<td>red peppers</td>
<td>17,330</td>
<td>125,000</td>
</tr>
<tr>
<td>onions</td>
<td>7,020</td>
<td>60,000</td>
</tr>
<tr>
<td>artichokes</td>
<td>1,440</td>
<td>14,000</td>
</tr>
<tr>
<td>melons</td>
<td>7,800)</td>
<td></td>
</tr>
<tr>
<td>watermelons</td>
<td>25,370)</td>
<td>280,000</td>
</tr>
<tr>
<td>miscellaneous</td>
<td>13,400)</td>
<td></td>
</tr>
</tbody>
</table>
Marketing

Private firms play a major role in the marketing of fruit and vegetable products except for olive oil and wine for which the "Office National des Huiles" (ONH) and the "Office National du Vin" (ONV) have a state monopoly on domestic marketing and foreign trade. All other products are marketed through independent agents or private firms.

Tunisia exports only a small proportion of her production of fresh vegetables, and exports of vegetables fluctuate widely.

The main export products are potatoes, onions, fresh tomatoes, and carrots. Potatoes are the main export vegetable product. Exports of fresh tomatoes are small but are steadily increasing as improved marketing organization for early tomatoes is being encouraged. Exports of canned vegetables (tomatoes, tomato concentrate "harissa") have decreased rapidly from 5,675 tons per year in 1975 to 635 tons in 1980 mainly as a consequence of the high production cost of tomato concentrate. France is the traditional and almost exclusive destination country of Tunisian exports.

Prices

Prices of fruit and vegetables are, for most products, freely determined on the market. Wholesale markets play a leading role in price formation. For some products and in some regions, where large quantities are traded outside the wholesale markets, producer prices may not be determined in wholesale markets. For freely traded products, the government price policy is limited to fixing marketing margins at the retail level. Control and enforcement of this regulation is difficult given informal organization of the marketing system, the absence of official standards, and the responsibility of municipalities in administering wholesale markets.

Government price policy is more constraining for dates, olive oil, wine-grapes and wine (all products which can be stored) as well as for tomatoes and apricots for processing.

Exports

Except for products covered by a state monopoly (olive oil and wine), exports are performed by private agents. The role of GIAB, GIL, and GID regarding exports is to coordinate the activities of exporters, to promote
exports and to provide technical assistance to producers and exporters. In fact, the GIAF and the GIL have gone beyond this limited role and effectively engaged in commercial activities with foreign institutions. These activities have materialized mainly as contract sales with parastal marketing boards of countries other than France (e.g. Yugoslavia) with the objective to diversify Tunisian foreign trade. This extended role of GIAF and GIL is explained by the failure of private exporters to implement an active export strategy.

Consignment is the most common method of selling fruit and vegetables on the export market. With consignment, the risk remains with exporters as no minimum price is guaranteed. Furthermore, as fruit and vegetable products are perishable, the buyer is in a powerful position to push prices down, especially on days or weeks when supply is high. Consignment is not, therefore, a selling method enabling the exporter to obtain the best price for his products or to plan a steady development of exports.

THE VEGETABLE MODEL

Main objectives for developing a model for the vegetable crops subsector were to assess the capacity of Tunisia to produce vegetables to satisfy the rapidly expanding domestic market both during the season and off-season and to identify the effects of the EC enlargement to Spain and Portugal on the ability of Tunisia to export vegetables at competitive prices. As Tunisia is presently exporting only small quantities of vegetables, these effects must be assessed in terms of improved or reduced competition on the export market.

A third objective, of a methodological nature, was to test the possibility of taking into account, in a sector model, the complexity of vegetable production and marketing especially seasonality of land use, and product quality. The development of such a model seems has not been previously attempted.

A final objective was to test the usefulness of such a model in the planning and policy process of a Ministry of Agriculture. The test is whether an operationally useful tool can be developed and transferred to a planning/policy unit in a Ministry where it will be maintained and updated as needed.
The model is a linear-programming model with endogenous domestic prices and exogenous export prices. This modeling approach was chosen because it enables one to account for: (1) limited availability of factors for vegetable production; (2) technological change on the basis of projected input-output coefficients for the considered horizon; (3) interaction between domestic demand, supply and prices; and (4) competition between domestic demand, supply and prices; and (4) competition between the different markets, domestic and foreign, for different periods and for different product qualities.

However, the approach has a number of shortcomings as it requires: (1) detailed estimates of input-output coefficients by crop, by region (or zone), by product quality or quality mix, and by period reflecting alternative techniques; (2) demand curve estimates, by type of product and period; (3) information on conditions under which products can be "transferred" from one market to another through storage, processing, downgrading ... (4) the excessive reaction of the model in the face of fixed exogenous export prices. As a result, a large amount of time was devoted to data collection and cross-checking to reach an acceptable level of precision.

The model was developed for 1990, the most likely date for termination of the transition period after Spain and Portugal entry into the EEC. As all technical coefficients are exogenously determined, building the model for several time horizons would have required generation of a whole new set of technological coefficients.

**TREE CROPS**

The main objectives for developing a simulation model for Tunisian tree crops are:

- to estimate Tunisian export potential and production costs during the next decade; this export potential can be compared with EC imports forecast after enlargement obtained from the international trade model in order to identify the impact on the Tunisian tree crops subsector;

- to develop a flexible analytical instrument which, beyond the present study, would be useful to Tunisian decisionmakers for the planning of the tree-crops subsector.
The methodology and modeling technique were selected on the basis of the following considerations: (1) factors of tree crop production; (2) data availability; (3) resources available for model development; (4) transferability of the model; (5) flexibility of the technique.

Simulation models were developed separately to forecast supply and production costs. The supply model covers the following products: olive oil, table olives, citrus fruits, palm dates, wine grapes, table grapes, apricots and almonds.

**Vegetable Exports Prospects for Tunisia**

The main results and conclusions of the analysis are as follows:

1. Tunisian production of fresh vegetables can increase significantly in the coming decade to satisfy the rapidly increasing domestic demand and allow increased exports. This is possible, even without increasing the irrigated area devoted to vegetable crops, as yields are still low compared to international standards.

2. Domestic prices in 1990, as simulated by the model, are lower than present average prices (in constant terms); this is the consequence of technological assumptions including significant yield increases leading to improved ability to satisfy domestic demand on the same land basis and reduced costs of production. These assumptions were based on a very conservative interpretation of a recently conducted study on vegetable production in Tunisia.

3. Domestic demand in 1990, as simulated by the model, is generally higher than trend projection. This is consistent with the assumed rapid technological progress.

4. Based on model results, vegetable exports could develop significantly in the future. Export development, however, requires the use of sea transport, except for tomatoes, red and green peppers. These results are based on average monthly entry prices of products in France. Significant price differences are observed depending on product quality. Prices of the highest quality product can be 50 or 100% more than these average prices. Thus, small quantities of high quality products could be exported by air. The most favorable period for exports is from March to May.

5. The vegetable export marketing organization is still very weak in Tunisia. This is considered by French
importers as the main cause of the poor performance of Tunisia on the export market. Importers consider that Tunisian vegetables are tasty but fragile because of inadequate picking, sorting and packaging. Supply is irregular and prices are high compared to other export countries. Potatoes and tomatoes account for most of French imports from Tunisia. Potatoes are mainly imported from March to June, before imports from Italy and Spain. Development of export is limited as France imports relatively small quantities during this period. Tunisian potatoes are comparable and compete with Moroccan ones; Spanish imports are of an inferior quality. Tomatoes could be imported from November to May by Tunisia, exports only from March to May. Main competitor is Morocco as Spain has not yet the adequate varieties.

Despite the EC-enlargement Tunisia may export in the future increased quantities of vegetables provided productivity and product quality are improved.

Export development actions should, in the coming years, be aimed at the French market for the following reasons:

(1) Tradition commercial links exist especially in the vegetable sector--thus, it will be easier to form a panel of importers in France than in any other country.

(2) Many French importers recognize that Tunisia has a good potential for vegetable production and have a relatively favorable attitude towards Tunisian product which are considered as tasty but poorly graded and packaged.

(3) Air and sea transportation are more frequent and offer a larger capacity than on any other destination. Tunisia can thus guarantee a regular supply by air and sea to France. This is not presently possible to other destinations. The French market should receive highest priority until production and marketing problems are solved and exports have become significant.

Fruit and Fruit Products Exports Prospects

Fruit and fruit products account for most of agricultural exports and are directed predominantly towards the EC. Effects of the EC enlargement and exports prospects must be discussed for each product separately.
Apricots

This study concentrated on internal Tunisian factors which may affect export prospects and relied on a qualitative analysis of the EC market. Tunisian domestic consumption will tend to increase faster than production despite an important planting and replacement program. Such a total deficit may not prevent Tunisia from exporting early apricots. Tunisia has a clear advantage on the European market during a two-week period (May 15-30) when no other competitor exists. This market can be very profitable on the basis of present EC entry price, marketing cost and production cost.

Citrus Fruit

EC-enlargement effects on prices for third countries are estimated between 0 and -5.5 for oranges, -2.0 and -5.5% for tangerines. The EC will remain a net importer of oranges except in October and November, but become a net exporter of tangerines.

Tunisian exports are mainly Maltaise oranges which are unmatched in juiciness and flavors. A specific demand thus exists for Maltaise and exports could increase significantly since this demand is only partially satisfied.

Almonds

The EC-enlargement will result in a slight decrease in price for non-member countries (-1.3%) and an increase in price in Spain and Portugal (5.5%). In 1990, the EC-12 remains a net importer of almonds for 30 to 40,000 tons of almonds.

Over the next two decades, Tunisian production should increase rapidly (6.1% p.a.) as a result of yield increases (3.3% p.a.) and new plantings mainly in northern and central regions. Domestic consumption will increase even more rapidly (6.8% p.a.) because of a high income elasticity. Exportable surplus will thus decrease slightly from average of 5,000 tons in 1980 to 3,000 tons in year 2000.

Export opportunities exist in the EC (especially France) and in North Africa (mainly Algeria and Libya). Tunisia could increase exports and capture a larger share of the EC-market. Tunisia should negotiate preferential access to the EC market as a partial compensation for the likely reduced access for wine and olive oil.

Dates

As neither Portugal nor Spain produce dates, EC-enlargement will not affect trade and consequently Tunisian exports.
Export prices have been high and provide a high economic return to date production and export. Prospects for exports are extremely favorable as international demand is increasing, production is stagnating and Tunisian dates are recognized as being of prime quality. Tunisia will not be able to seize these export opportunities unless a major production development program is implemented. Given the high economic return of date production and the expected gains in foreign currency, such a program should receive high priority.

**Olive Oil**

EC-enlargement will modify completely the conditions of the international market as it involves the two largest producing, consuming and trading countries: Italy (a net importer) and Spain (a net exporter). EC enlargement will have adverse consequences on Tunisian exports. Trade diversion effects will result in Spain exporting more to Italy which is the main destination of Tunisian oil. More important, the extension of the CAP to Spain lead to higher prices for olive oil and lower prices for other vegetable oils, resulting in increases in production and decreases in consumption. The combined effect will be an excess of production over consumption estimated at 160,000 tons. With such excess production, it is doubtful that EC will continue to import from non-member countries and it may sell large quantities at a subsidized price on the international market in competition with existing exporters such as Tunisia.

In Tunisia, domestic production will increase at an annual rate of 3.3% and domestic consumption of vegetable oils at 2.6%. Thus, the exportable surplus of Tunisia will increase while the EC market will progressively close and eventually become a competitor on third markets. Tunisian export prospects are very poor and cannot justify the present planned development of olive oil production.

**Wine**

The EC is facing a severe internal market imbalance due to increasing production and decreasing consumption of wine. The EC enlargement will aggravate the present market imbalance. As prices are higher in the EC, prices in Spain and Portugal are likely to increase after enlargement. The resulting supply and demand effects are estimated at 16,000 hectoliters—about 10% of present EC-10 wine production.
In Tunisia, production will increase by 70% between 1980 and 1990, and by 200% between 1980 and 2000, due to the ambitious planting program. A shift from ordinary wine to quality wine is planned. Domestic consumption is low, increasing with income and the development of tourism, but will account for less than a third of production in 1995. Exportable quantities will nearly triple by 1995.

Tunisian exports to the EC have been declining as a consequence of slackening demand for ordinary wines. The reference price system is a major obstacle to Tunisian exports of ordinary wine. Protective measures by the EC can only be reinforced in the future. Thus, Tunisia cannot expect any significant increase in exports of ordinary wine and must concentrate her export development effort on quality wines.

In order to adjust to reduced wine exports prospects, Tunisian should:

1. take advantage rapidly of the presently unused duty-free access to the EC for bottled quality wines from Tunisia by increasing bottling facilities and engaging in export promotion actions;
2. maintain the conversion program of ordinary to quality vineyards in selected and limited areas;
3. reduce the planting program in order to stabilize or even reduce production of ordinary wine;
4. negotiate a limited guaranteed access to the EC market during the transition period in order to allow the proposed adjustment; and
5. negotiate a preferential access to the EC for less sensitive products as a compensation for lost export revenues.

Planning and Policy Analysis with Sector Models

The usefulness of models for planning and policy analysis of the fruit and vegetable sector is discussed in relation to several criteria:

1. the adequacy disaggregation required for analyzing closely differentiated fresh products;
2. the type of modeling method and its complementarity to the approach followed by decision makers; and
3. the possibility of transferring and maintaining these models in the study country.
A. **Disaggregation**

Marketing of fresh products, especially off-season, is an extremely complex activity. Fruit and vegetables must meet strict standards or may remain unsold and spoil or be sold at a loss. A very detailed product definition is required to account satisfactorily for marketing factors. This includes: type of product, variety, period (month or two weeks), and quality (which in itself includes many different criteria such as taste, color, size, homogeneity, packaging, etc.). Quality is a decisive factor on product price and consequently the economic return of production and exports. Yet the quality factor is extremely difficult to include in a formalized representation of a sector, because it is difficult or impossible to define quality classes, to estimate production by quality classes, and to relate production techniques and production cost to product quality.

In this study, the finest possible product definition was used given data and resources constraints. For vegetables, an export and a local quality were defined and time was disaggregated by month. For fruit, the definition of product types was based on variety related to quality or production period and on production areas.

The level of disaggregation used appears, ex post, to be the minimum necessary to identify the main trends in production or the marketing issues, especially on the export market. On the other hand, it seems difficult to constrict a finer disaggregation in such models. The vegetable crops' LP model is already large. Seasonal price variations have been reasonably simulated but an improvement of the estimation of input-output coefficients for season and off-season crops should receive a higher priority than the use of a finer time or product disaggregation. With some additional collection of information, a time disaggregation could be introduced in the simulation models for citrus fruit and apricots.

The methodology and disaggregation used in this study can be successfully used to identify the main line of the development strategy to be adopted for the sector and to identify the main issues in production and marketing of fruits and vegetables. These aspects would be completely masked with broader product definitions. Actual implementation of this strategy, however,
requires detailed market studies taking into account the qualitative factors (product quality, institutions, etc.) which cannot be formalized into a model.

B. **Modeling Method**

The simulation models developed are extremely simple: they account for the main factors of production—type of production, production area, age structure of the orchard and technological progress. They do not include any behavioral component. Supply and demand are treated separately. Despite this simplicity, they require information which is not always readily available.

The main advantages of this approach are:

1. **Consistency with the approach traditionally used by planners.** Decisions by decisionmakers will therefore readily grasp the value and limitation of such models and, consequently, will interpret and "trust" model results.

2. **Stimulation of data collection related to critical factors of production.** Data collection and analysis on age structure of orchards and technological progress, for example, can result immediately in improved forecasting.

3. **Ease of use.** Many scenarios based on various hypotheses concerning technological progress or plantings can be run. This allows an "exploration" of the future which reduces uncertainty for decisionmakers.

The linear programming approach is potentially richer as it accounts for the main factors of supply and demand and simulates market equilibrium to generate endogenous prices. This theoretical superiority does not materialize entirely as it is difficult to formalize the qualitative factors which bear heavily on product price. It is difficult to relate quality to input-output coefficients and cost. Thus, the generation of monthly endogenous prices for vegetables is only approximate although it is a major improvement on yearly models which should be considered as completely unsuitable for fresh products.

The vegetable crop model for Tunisia was successful identifying the production capacity of the sector on a given land base, the main trends in domestic demand and production, the interaction between domestic demand and exports during the off-season months, the main products for which Tunisia could develop exports and the interaction and competition of each vegetable crop for limited resources. These results, however, cannot be used directly to define a program for off-season vegetables geared at the export market.
The major disadvantage of the LP method is its complexity. Obtaining and interpreting results require some technical skill. The approach in analyzing the results is not consistent with the "natural" approach of decisionmakers. Conclusions are therefore less likely to be accepted by decisionmakers.

C. Transferability

Two main factors affect the transferability of a model: their usefulness as assessed by decisionmakers, and the technical difficulties involving mainly training of staff and computer facilities.

The simulation models developed in this study should be transferred rapidly and easily, as they are perceived as an improvement in the present planning approach. Besides, because of their simplicity, these models do not require theoretical training and they can be installed on mini- or micro-computers. The linear-programming model for vegetables may be difficult to transfer for the opposite reasons. A specific effort to explain the methodology, results and possible uses will be required.