PN-ABW-704

Best available copy -- pages 69 & 70 missing

PN ABU-7C

A.M.I.
Agribusiness Marketing Investissement
30, Avenue des F.A.R., 6eme Etage - Casablanca - MOROCCO
Tel.: (212) (2) 44-25-51/44-25-96 - Fax 44-21-07

MOROCCAN FRESH FRUIT SUBSECTOR STUDY

AND

RECOMMENDATIONS FOR PROJECT ACTIONS

January, 1995

Prepared by:
William J. Grant, DAI
Dr. J. Scott Cameron, PIP
Dr. Ahmed Mahhou, IAV
Raphael Rebibo, DAI

MAPP - 13

USAID CONTRACT N° 608-0210-C-00-2044

Projet de Promotion d'Agribusiness au Maroc
MAMVA DAI USAID

Foreword

The Moroccan Fresh Fruit Subsector study is the seventh of eight subsector studies and commodity action plans to be prepared by the Agribusiness-Marketing-Investissement (A-M-I) portion of the Morocco Agribusiness Promotion Project (MAPP). The AMI has many tools and resources to assist private businesses, both in Morocco and the United States. In order to deploy these resources, AMI is preparing an action plan for each of the eight subsectors based on an analysis of the structure of the subsector and the evolution of the markets for the products in that subsector, either new or old. These studies will provide the project with an analysis of the evolution of each of the subsectors and permit the project to compare the potential benefits and returns from applying its resources to one or the other of the subsectors and will highlight those areas with the greatest potential return within a given subsec.... The goals of the study are to develop concrete actions for the project to undertake, through:

- highlighting the opportunities and constraints facing the subsector, especially those which the project can take concrete steps to address;
- providing the basic understanding of the opportunities which is necessary to serve as a preliminary screen for the Promotion and Investment Fund (PIF) requests;
- generating baseline data on the project clients as well as the basic information needed for product promotion;
- providing a clearer identification of potential buyer and investor opportunities and linkages; and
- introducing the project to potential partners for investment opportunities and other project activities in Morocco's agribusiness community.

In order to analyze the sector, the study uses a subsector diagnostic approach to identify the principal channels through which product flows from the fields to the consumer, the trends in the industry, points of leverage, and the opportunities and constraints facing the industry. By differentiating the channels and identifying the points of leverage (those points in the industry where a concerted effort will have the largest payback) the action plan will determine the best ways to approach the constraining factors and identify the opportunities which exist.

The initial fieldwork was carried out in early June 1994 by members of the AMI staff in conjunction with three specialists in the field[1]. During the four weeks over which the field

[1] The team was assisted by one marketing specialist who had worked extensively for a leading French Fresh Produce Importing company, and two production specialists: one a leading strawberry and caneberry researcher from the University of Washington with extensive private industry consulting experience and the other a member of the faculty of the

work was conducted, more than thirty private Moroccan firms and agencies involved in early season fresh vegetable and fruit production, supply, marketing, and logistics were interviewed, along with the relevant public sector agencies with the task of supporting the operators in the sector. In an effort to get the widest view of existing and potential activities, the team visited agricultural businesses in Casablanca, Azzemour, Agadir, Taroudant, Rabat, Kenitra, Larrache, El Jadida, Marrakech, Meknes, and Fes.

The subsector study examines the nascent Moroccan Fresh Fruit subsector. Recent exports of melons and strawberries have grown rapidly, stemming from the dynamic fresh produce grower/exporters (reviewed in the Early Season Fresh Vegetable Subsector Study), but other fresh fruit exports are barely noticeable. Tree fruit exports, led by peaches, are just becoming perceptible on the international market. Many factors are responsible for this slow development. One important dynamic is the relatively high price on the local market for several fresh fruit (apples, pears, cherries, grapes). Another is the lack of control of the product from the field to packing house (apricots, grapes) or the competition from the processing sector (apricots) and the difficulty of getting the product ready at the time when the main export markets are paying prices which mke the activity worthwhile

Whereas increasing exports of other products may have depended diversification, establishing fresh fruit exports depends on the private sector's interest in developing new varieties which match the demand in the markets. The report analyzes the historic trends in production and exports, analyzes the principal market opportunities for Moroccan expansion, the factors constraining that expansion, and recommendations for project activities.

Chapter One reviews fresh fruit production in Morocco, followed by a review of the major production issues encountered by the producers in Chapter Two. Chapter Three looks closely tree fruit production, varieties and costs of production, while Chapter Four does the same for other fruits. Chapter Five looks at the major markets for Moroccan fresh fruits, and Chapter Six analyzes the flow of the production of various fruits, strawberries, and apples, identifying and describing the different channels and driving forces. strategic overview, as well as on a country by country basis, highlighting some of the main opportunities. Chapter Seven reviews the supporting environment, including legislation and institutions, and leads into the definition of the driving forces and points of leverage within the subsector in Chapter Eight. These driving forces and points of leverage should dictate the best points for collaboration with the industry to achieve greatest impact at least cost. Finally a perception of the opportunities facing Morocco, the constraints to attaining those opportunities and a vision of what Morocco's the future could bring, lead up to Recommendations for Project Actions.

The **Recommendations for Project Actions** present the preliminary recommendations on the steps which are necessary to expand Morocco's overall fresh fruit exports. Some of these are more directly within the project's control, either through work with the collaborating institutions such as MAMVA, the EACCE, or the trade associations. But many more of the activities are dependent on interest within the private sector, the source of Morocco's dynamism. The project action plan for direct collaboration with the private sector must be

---

Institute for Agronomy and Veterinary Sciences, Hassan II, specializing in fruit production.

kept very general, highlighting the activities which appear to have the highest possible payoff, but which don't eliminate activities which might be in the direct interest of the private sector to carry out. The process of working with the private sector is an iterative and dynamic one, which will be ongoing throughout the life of the project. In an endeavor to maximize private participation in discussion with the project, a series of meetings and presentations are planned to get feedback from the private sector and concerned agencies on the recommendations stemming from the study. From these meetings, collaborative plans will be elaborated between the private operators, the concerned government agencies, and the representative associations.

The findings, conclusions, and recommendations presented in this report are the opinions of the consultants and they take responsibility for any errors or misconceptions.

TABLE OF CONTENTS

Foreword i

TABLE OF CONTENTS iv

LIST OF TABLE BOXES vi

LIST OF FIGURES vii

EXECUTIVE SUMMARY viii
- I. OVERVIEW viii
- II. MAJOR CONCLUSIONS ix
- III. DRIVING FORCES x
- IV. RECOMMENDATIONS FOR PROJECT ACTIVITIES xii

I. AN OVERVIEW OF FRESH FRUIT PRODUCTION IN MOROCCO: TEMPERATE TREE FRUIT, SMALL FRUIT AND VINE CROPS 1
- A. INTRODUCTION 1
- B. FRUIT PRODUCTION AND ECONOMIC AND SOCIAL DEVELOPMENT 1
- C. TEMPERATE TREE FRUIT, SMALL FRUIT AND VINE CROPS 2
- D. OTHER FRUIT CROPS 5
- C. CLIMATE AND WEATHER 5
- D. SOIL, WATER, AND IRRIGATION 6
- E. REGIONS OF PRODUCTION 8
- F. TYPICAL PRODUCERS 8

II. DESCRIPTION OF THE FRESH FRUIT SUBSECTOR ORGANIZATION 10
- A. DEFINITION OF THE SUBSECTOR MAPS 10
- B. GENERAL FRESH FRUIT SUBSECTOR MAP 12
- C. STRAWBERRY SUBSECTOR 17
- D. APPLE MAP 23

III. OVERVIEW OF OTHER FRUIT CROPS PRODUCT BY PRODUCT ANALYSIS 28
- A. PEACH AND NECTARINE PRODUCTION 28
- B. PEAR PRODUCTION 30
- C. SWEET CHERRY PRODUCTION 31
- D. PLUM PRODUCTION 32
- E. APRICOT PRODUCTION 34
- F. GRAPE PRODUCTION 35
- G. MELON PRODUCTION 38
- H. FRAISE DES BOIS: A SUCCESSFUL NICHE MARKET FOR MOROCCAN EXPORT PRODUCERS 40

I. POTENTIAL FOR PRODUCTION OF CANEBERRIES AND OTHER SMALL FRUIT CROPS - CANEBERRIES, BLUEBERRIES, AND BUSH FRUITS 41

IV. EXPORT MARKETS FOR MOROCCAN FRUIT PRODUCTS. 44
A. OVERVIEW OF MOROCCAN EXPORTS 44
B. MAJOR POTENTIAL MARKETS FOR MOROCCAN PRODUCT 44
C. DISTRIBUTION CHANNELS, BY COUNTRY: BELGIUM - HOLLAND THE U.K. - GERMANY - FRANCE 56
E. SAUDI ARABIAN MARKET 62

V. INSTITUTIONAL INFRASTRUCTURE IN MOROCCO RELATED TO FRUIT CROP PRODUCTION 64
A. RESEARCH, TEACHING, EXTENSION 64
B. GOVERNMENT REGULATORY 69

VI. CONCLUSIONS AND RECOMMENDATIONS FOR PROJECT ACTION . . . 73
A. CONCLUSIONS 73
B. DRIVING FORCES 75
C. RECOMMENDATIONS FOR PROJECT ACTIONS 77

LIST OF ANNEXES

Annex one:	Firms Contacted during the study
Annex two	Producer Outlooks
Annex Three	Profitability Calculations
Annex Four	Varietal Descriptions
Annex Five	Strawberry Production in Morocco
Annex Six	Grape Production in Morocco
Annex Seven	Production Techniques by Product in Morocco
Annex Eight	Local Wholesale Market Prices
Annex Nine	Wholesale Market Information in Rungis, Covent Garden, and Hamburg
Annex Ten	Moroccan Fresh Fruit Exporting Companies
Annex Eleven	Cold Storage Information
Annex Twelve	Research Topics covered at the IAV and DPVCTRF procedures.

LIST OF TABLE BOXES

Table 1. Surface area of cultivated temperate tree fruit, small fruit and vine crops in Morocco. 2
Table 2. Growth in surface area planted to tree fruits over the past five years (1988-93) in Morocco. 3
Table 4. Price of fruit tree plants sold by SO.DE.A. in 1993. 13
Table no. 5: Storage in Morocco and Capacity Dedicated to Fresh Produce 14
Table 6: Wholesale Market Sales 16
Table 7: Establishment Costs for one hectare of Strawberries (in U.S. $) 20
Table 8: Approximate Profitability of Fresh Strawberry Production in Morocco (40 tons production) 22
Table 9: Profitability of Early and Late Varieties 26
Table 10: Profitability of Export market production Peaches 29
Table 11: Profitability of Early and Late Peach Production for the Local Market . . . 30
Table 12: Profitability of Fresh and Stored Pear Production 31
Table 13: Cherries produced for the Export and Domestic markets. 32
Table 14: Return on the investment in a hectare of plums for prunes 33
Table 15: Profitability of Apricot production for Fresh Domestic Market and Processing 35
Table 16. Area (Ha) covered by table grape production by region. 36
Table 17: Changes in Moroccan table grape production over the last five years. . . 36
Table 18. Primary table grape varieties grown in Morocco. 37
Table 19: Return to the production of a hectare of table grapes 38
Table 20: Return on Greenhouse Melon Production 40
Table 21: Moroccan Fresh Fruit Exports 1991-1994 44
Table 22: EUROPEAN UNION IMPORTS OF THE SEVEN FRUITS IN 1992 . . . 45
Table 23: European Union strawberry imports(tons) 45
Table 24: Optimal Strawberry Exports 46
Table 25: European Union Peach Imports (tons) 46
Table 26: Optimal Peach Exporting Periods and Markets 47
Table 27: European Union imports of melons (tons) 48
Table 28: Optimal Markets and Periods for Melon Exports 49
Table 29: Euuropean Union imports of apricots 49
Table 30: Optimal Periods and Markets for Apricot Exports 50
Table 31: European Union imports of grapes (tons) 51
Table 32: Optimal Periods and Markets For Grape Exports 52
Table 33: European union imports of cherries (tons) 52
Table 34: Optimal Periods and Markets for Cherry Exports 53
Table 35: European union imports of raspberries (tons) 53
Table 36: Optimal Periods and Markets for Raspberry Exports 54
TABLE 37: QUALITATIVE CRITERIA DEPENDING ON MARKETS 55
Table 38: Saudi Imports in 1991 63

LIST OF FIGURES

Figure 1 General Fresh Fruit Subsector Map, 1993/94 15
Figure 2 Strawberry Subsector, base map 19
Figure 3 Strawberry Volume and Value Map 21
Figure 4 Fresh Apple Subsector Map 24
Figure 5 Belgian Distribution Networks 56
Figure 6 Dutch Distribution channels, source: 57
Figure 7 British Private Channels of Fresh Fruit Distribution 59
Figure 8 German Channels of Import and Distribution 60
Figure 9 French Distribution Channels for Fresh Fruit 61

EXECUTIVE SUMMARY

I. OVERVIEW

The Fresh Fruit Subsector[2] has only recently returned to the status of an important exporting subsector. Five years ago, Moroccan exports of fresh fruits other than citrus were practically non-existent. However, in 1993/94 Morocco exported 7,785 tons of melons and 6,967 tons of strawberries, firmly placing Morocco on the map as a leading supplier of these fresh products, primarily to Europe.

Moroccan Fresh Fruit Exports 1991-1994

PRODUCT	1991/92	1992/93	1993/94
MELONS	2,635	5,165	7,785
STRAWBERRIES	995	5,152	6,967
PEACHES	339	729	835
APRICOTS	143	402	165
NECTARINES	24	253	300
CHERRIES	4	-	-
FIGS	13	2	-
TOTAL	4,153	11,677	16,061

Source: EACCE

While Morocco's exports of the perennial fruits have been limited to date, there should be an increase over the near term as overall acreage for the tree fruits has increased substantially, from 45,000 ha in 1988/89 to 58,477 in 1992/93. The upward trend seen in the export of peaches and nectarines will likely continue, due to the increase in acreage of 25% along with the development/adaptation by many individual growers of varieties which can reach the markets earlier.

Production of Morocco's fresh fruits is located all over the country: Strawberries in the North (Rabat-Larache), rosaceous fruits in the Center North (Khemisset - Fes), the South (melons in Marrakech and Beni-Mellal) and the Southeast (strawberries, melons, and tree fruits).

[2]This analysis does not look at citrus, the most important Moroccan fresh fruit export, though the citrus industry plays an important role as a lever for the rest of Morocco's fresh fruit exports.

II. MAJOR CONCLUSIONS

1. *Marketing*

The potential for expansion of the Moroccan fresh fruit subsector is considerable. It is driven by opportunities for export and enhanced markets at home. Morocco can produce a wide variety of fresh fruit crops for both the national and export markets.

Morocco is ideally located to become a major supplier of fresh fruits to the European market. For Morocco to expand its exports, it must reach the markets at the times of peak prices, mostly earlier in the season than they are currently producing.

PRODUCT	TARGET COUNTRIES	OPTIMAL REALISTIC EXPORT PERIOD & PRICE
PEACHES	France, Germany, UK	April, May and June: 10 FF/kg
APRICOTS	France and Germany	Extend production to early May: up to 70 FF/kg
STRAWBERRIES	Germany, UK and France	January and February (24 FF/kg), March (18 FF/kg), April (11 FF/kg)
RASPBERRIES	France and UK	January - April 55-70 FF/kg.
GRAPES	France, UK, and Germany	July: (7-7.5 FF/kg)
MELONS	France, UK, and Germany	March (8 FF/kg), April (11 FF/kg) and May (8 FF/kg)
CHERRIES	Germany and UK	May (9-10 FF/kg), June (11 FF/kg), July (8 FF/kg)

Source: Eurostat

Morocco has only recently taken advantage of its edge in the annual crops (strawberries and melons), and not yet mastered its position for the perennial tree and vine crops. Morocco can produce most fruits a little bit earlier than in Europe and well after the Southern Hemisphere producers, giving it a good production niche.

Competition between the local market and exports for fresh fruit has hurt the overall move towards increasing exports. The local market is easier to work with; it is less demanding on quality and packaging, and yet still pays high prices.

2. *Production*

In order to meet these optimal marketing periods, there must be advances on the production side.

Most Moroccan fresh fruit producers are dependent on imported technology which has yet to be fully adapted for optimal productivity under Moroccan conditions. In the short run this is limiting the ability of the Moroccan producers to compete efficiently.

Moroccans must obtain new varieties to successfully reach the right time periods. The primary demand lies in obtaining early ripening varieties for the export market, but eventually they will need to increase yields, and broaden the regions of production.

The Moroccan fruit industry must implement new approaches to pest management in order to respond to serious realities in the areas of pesticide residues, environmental preservation and farm worker safety.

There has been a gradual migration of production of certain crops from Spain southward, in particular strawberries.

3. *Industry Structure*

The Moroccan fresh fruit subsector, overall, is not well organized. There is competition between most members of the subsector where there should be collaboration - breeding, research, marketing, sharing information. Particularly when considering exports, the Moroccan producer/exporter's main competitor should be the producers from other countries, not his neighbor.

Relatively few Moroccan producers are growing fresh fruit for export. Compared to early fresh vegetables, the export markets are dominated by the large integrated growers who are able to grow and export themselves, taking advantage of economies of scale for logistics.

III. DRIVING FORCES

There are many positive and a few constraining factors driving change in the fresh fruit industry: market demand both local and for export; increasing industry sophistication; new methods of transport; lower costs of labor than traditional suppliers; foreign investment; varietal introductions; and the investment-payback cycle.

Market Demand. In spite of a recent drop in imports from the major consuming countries, there has been a steady increase in imports of fresh fruits by the countries of the European Union. Inside Morocco, there has been a steady demand for fresh fruit, with little exactitude for quality or packaging. This dual demand from within and without is leading more growers to invest in fresh fruit production.

The nature of the internal demand, with few requirements for quality and packaging, is a handicap for developing the tools and standards for export production.

Industry Sophistication. Among the products planted annually, like melons and strawberries, the large integrated grower/exporters have been able to react to the increased market demand for these products and put in large quantities of production at a time.

Transport. The development of refrigerated trucking for fresh vegetables (primarily tomatoes) has spilled over into the fresh fruit exports, developing the potential for melon and strawberry exports by truck. However, the cost of transport is still very high by all standards for Morocco's fresh products, which hurts its competitiveness.

The nature of the transport also dictates the structure of the economically viable exporter as well as the markets which can be reached. For strawberries, for example, a minimum of 25-30 hectares is required to be able to fill a refrigerated truck, making that the size of minimum viable fresh strawberry export farm. The inability to maintain product freshness over long transport distances has limited Morocco's ability to attack many markets other than the European market.

Foreign Investment. There has been an important investment by Spanish growers in the Northern part of Morocco, both as wholly owned companies and in partnership with Moroccan growers, for strawberry production. Meanwhile in the South, in the Souss-Massa, French and Spanish firms have been working with the large Moroccan exporters to develop synergistic supply relationships. These partnerships have brought technology, financing, and market contacts.

Varietal Introductions. One of the most important constraining factors has been the lack of new varieties being introduced and tested in Morocco. Morocco has an underdeveloped program for the acquisition, evaluation, and dissemination of new fruit varieties and rootstocks adapted to its climate. As a result, the growers are required to do their own testing. This has greatly slowed down the introduction and spread of new varieties.

Organization of the subsector. The lack of a coordinated effort among the institutions and growers in the subsector to work together on the introduction of new services and varietal introductions has slowed the overall rate of progress and Morocco's ability to present a united front in the export markets..

Lower labor costs. Morocco's lower labor costs and its proximity to Spain have been an important force driving the transfer of production from Spain to Morocco. These lower labor costs provide Morocco with a competitive edge for labor intensive products, such as strawberries, raspberries, and other small fruits.

Investment cycle. The rapid growth of the strawberry and melon exports reflects the rapid return on investment from these products. It will be expected that annual crops will grow and change more rapidly than the perrennials. Tree fruits (perrennials) will be slower to adapt, but represent a longer term investment once they are producing.

IV. RECOMMENDATIONS FOR PROJECT ACTIVITIES

The project can assist the private sector through a number of different activities, both to strengthen associations, help the government to develop new tools and improve its supporting environment for fresh fruit production and export.

1. Marketing assistance to the private sector

- facilitate the development of marketing databases from European wholesale markets which are continuously maintained and updated, accessible to the private sector.

- provide training to Moroccan firms to develop both short and long term marketing strategies.

- Increase contacts between Moroccan exporters and European buyers and the awareness of the distribution networks and quality requirements in the non traditional markets.

2. Help to obtain, evaluate, and disseminate new fruit varieties.

- Facilitate the development of an effective program for the acquisition, evaluation and dissemination of new varieties and rootstocks for the Moroccan fruit industry by identifying the main suppliers and putting the Moroccan growers in touch with them.

- Initiate a study to identify the most effective partnerships and coalitions among national and international public and private agencies for the acquisition of new germplasm for Morocco.

- Assist private and public partners to make contacts with fruit breeding programs throughout the world through enhanced information and organized visits (industry awareness tours).

- Assist the development of a national nursery program.

3. Develop efficient and economic options for product transport.

- Sponsor and co-finance research and commercial trials with grower/exporters and transport companies to adapt existing technologies for controlled and modified atmosphere to improve the life span of product under different modes of transport which will allow Moroccan fresh fruits to reach distant markets.

- Continue the work already begun on modifying the policy environment surrounding transport.

4. Assist the public and private sector in fruit production technology transfer and adaptation.

- Initiate exchange visits between Moroccan specialists and their public and private counterparts in technology exporting countries.

- Facilitate the establishment of long term relationships between the private sector and a broad range of vendors and service providers within and outside Morocco.

- Organize an industry awareness trip to the United States, centered around a seminar for fresh fruit postharvest handling.w1

5. Pest Management - Develop educational and technical strategies for improved efficiency and reduced health and environmental risks.

- initiate an analysis of pest management practices in Moroccan agriculture in order to assess inefficiencies as well as potential environmental problems.

- sponsor a series of workshops and field days for the fruit industry to address issues of pest management, phytosanitary regulations and standards for export worker safety, and risks for human health and the environment.

I. AN OVERVIEW OF FRESH FRUIT PRODUCTION IN MOROCCO: TEMPERATE TREE FRUIT, SMALL FRUIT AND VINE CROPS

A. INTRODUCTION

In recent years, the fresh fruit industry of Morocco has become one of the country's most dynamic agricultural subsectors. The potential for industry expansion is considerable and is driven by opportunities for exportation abroad and enhanced markets at home.

Of the 7.8 million hectares of agricultural land under cultivation in Morocco, 10% or some 780,000 hectares are devoted to fruit production. Approximately three quarters of that surface area is accounted for by olive (410,000 ha), almond (117,000 ha) and citrus (72,000 ha) cultivation. Temperate tree fruit, small fruit and vine crops may account for as much as three quarters of the remaining cultivated land in fruit crops.

B. FRUIT PRODUCTION AND ECONOMIC AND SOCIAL DEVELOPMENT

The fruit production subsector plays a key role in Morocco's social and economic development:

- it generates more than 12 million working days per year in rural areas.
- it is a major consumer of goods and services within Morocco given the intensive nature of horticultural crop production. This subsector is a heavy consumer of production inputs with an estimated average consumption of 90,000 T of fertilizers and 900 T of pesticides per year.
- it supplies products to food processing and export operations which generate further employment, primarily in urban areas of the country. These industries have played a key role in the development of a national cold chain for storage, transportation and marketing.
- it generates a substantial income to producers.
- it adds variety and improved nutrition in the diet of Moroccans as these products, in general, contain high levels of vitamins and minerals.
- it protects the land from wind and water erosion. Whether slopes are in the foothills of the Atlas Mountains or flatlands in the coastal piedmonts, tree fruit crops stabilize vast amounts of surface area in Morocco.
- it increases Morocco's exposure to the world economy and potential investments in Morocco.

C. TEMPERATE TREE FRUIT, SMALL FRUIT AND VINE CROPS

This group of commodities has seen significant growth in recent years due to expanding markets at home and abroad. Some of these crops have expanded rapidly in a short period of time (strawberries and melons), some have shown steady growth over the past decade (tree fruits), and others are trying to recover from setbacks over the past three decades (grapes).

There are three general types of commodities in the temperate tree fruit, small fruit and vine crops subsector which can be described as:

- Annually-cultivated crops whose production is expanding rapidly with relatively well-defined export channels and a growing local market.
  Examples: Melons and strawberries

- Perennially-cultivated crops whose production is expanding as fast as new varieties can be introduced and come into bearing. Relatively well-defined export channels exist and local market is expanding.
  Examples: Peaches and nectarines

- Perennially-cultivated crops whose production is expanding in surface area but which remain a locally marketed commodity with increasing demand.
  Examples: Apples and table grape

Surface area in production of temperate tree fruit, small fruit and vine crops
Total surface area of temperate tree fruit, small fruit and vine crops are listed in Table 1.

Table 1. Surface area of cultivated temperate tree fruit, small fruit and vine crops in Morocco.

CROP	SURFACE AREA (HA)	(%)
Pome Fruits		
Apple	25,610	18.6
Pear	3,420	2.4
Quince	2,650	2
Loquat	320	.2
SUBTOTAL	**32,000**	**23.2**
Stone Fruits		
Apricot	14,360	10.4
Peach-Nectarine	3,960	2.9
Plum	7,440	5.4
Sweet Cherry	690	.5
SUBTOTAL	**26,450**	**19.2**

Small Fruit and Vine Crops		
Melons	25,000?	18
Strawberry	1,200	1
Table Grapes	37,000	26.8
Wine Grapes	16,000	11.7
SUBTOTAL	**79,200**	**57.5**
TOTAL	**137,650**	**100**

source: MAMVA

Tree Fruit Production: A Decade of Steady Growth

Two major types of fruit trees make up this group: Pome fruits (apple, pear and quince) and Stone fruits (peach, plum, cherry, and apricot). The sector is very dynamic and characterized by its development and orientation in relation to market trends and consumer preferences.

Fruit trees are grown in the main production areas mentioned below, but the relative importance of crops in each region varies. This variation is largely due to climatic conditions. The majority of production is concentrated in the piedmont of the Atlas mountains and the plains of Saiss, High Moulouya and Gharb. The area of production has now also expanded to coastal areas because of the development of varieties with low chilling requirements.

In the early 1970s, fruit production accounted for only about 10,000 ha of Morocco's agricultural lands. The major expansion in the tree fruit industry is primarily due to promotion and incentives developed by the government of Morocco. The government encouraged growers to invest in fruit production by outlawing fruit importation and by establishing a formula of subsidies for buying trees, digging wells and for production inputs such fertilizers and pesticides. As a result, rosaceous tree fruit production has increased steadily over the past five years (Table 2), especially apples, peaches, plums and pears.

Table 2. Growth in surface area planted to tree fruits over the past five years (1988-93) in Morocco.

CROP	1988/89	1989/90	1990/91	1991/92	1992/93
Apple	17,000	21,000	22,000	23,580	25,610
Pear	2,700	2,900	3,000	3,150	3,420
Quince	2,200	2,300	2,400	2,400	2,651
Loquat					319
Apricot	13,400	13,500	13,900	13,470	14,355
Peach	3,150	3,250	3,500	3,700	3,955
Plum	6,000	6,500	6,600	7,100	7,446
Cherry	550	550	600	620	691
TOTAL	45,000	50,000	52,000	54,000	58,447

source: MAMVA

Since 1980, acreage in these tree crops has increased from 30,000 ha to its present 58,500 ha, an average yearly increase of 2000 ha per year. While increased production has been seen in most of these crops, growth has been most significant for apple for which surface area has quadrupled, followed by pear and quince for which acreage has nearly doubled. Surface area in peaches has tripled and for plums more than doubled.

Within the tree fruit industry, pome fruits represent 55% of the total acreage with 32,000 ha compared with 45% of production in stone fruits with 26,450 ha. Apples are the predominant crop in pome fruits with 25,610 ha covering 80% of the area and 44% of production. Among stone fruits apricot is the most important with 14,360 ha representing 54% of stone fruit production and 25% of the total surface area.

Recent industry expansion in apple and peaches has been due primarily to the introduction of low chilling cultivars in the early 1980s and the expansion of culture at lower elevations. Increases in plum acreage reflects new plantings of Stanley plum for prune production due to the development of a demanding local market.

In addition to the overall increase in acreage, there has been a renewal of many of the trees, which will lead to increased yields in the future. The Moroccan government's investment in developing irrigated lands (target of 1 million ha. by the year 2000), continues to be a positive factor favoring the development of tree fruit production (see Processed Fruits and Vegetables Subsector Study for complete discussion of this government policy).

Growth in exports of temperate tree fruit, small fruit and vine crops
While it may only represent 15-20% of land in fruit production in Morocco, the temperate tree fruit, small fruit and vine crop sector has considerable potential for profitable exports abroad. The growth of exports in this sector is demonstrated in Table 3.

Table 3. Recent export trends for selected temperate fruit crops from Morocco.

Crop	1991/92	1992/93	1993/4
Melons	2,635	5,165	7,785
Strawberries	995	5,120	6,967
Peaches	339	729	835
Nectarines	143	402	165
Apricots	24	253	300
Sweet Cherries	4	-	9
Figs	13	2	-
TOTAL	4,153	11,671	16,061

source: MAMVA

Growth in domestic consumption
While there are no firm statistics for domestic consumption, all general indicators and discussions with producers show an increase in the domestic demand and consumption. The Moroccan population growth rate of 3 percent per annum, alone, will lead to a steadily increasing internal demand. When matched with gradually increasing purchasing power,

there will be even more pressure to consume the fresh fruit production locally, reducing the quantities for export.

D. OTHER FRUIT CROPS

Other fruit crops which have varying degrees of production, interest or potential include bananas, avocados, mangoes, kiwi, jujubes, kaki (persimmon), walnuts, asian pear, blueberry, raspberry, and blackberry.

Predictable trends have developed with certain crops and have limited their potential for the foreseeable future. In the case of bananas, while there are approximately 400 ha currently in greenhouse production, the Moroccan market is fairly well saturated by a rush of production initiated when banana imports were outlawed over a decade ago. Moroccan costs of production for bananas are still well above the world market price. While some companies are moving to subtropical crops such as avocados and mangoes, this too is a market which will saturate in time without a significant increase in national consumption. Larger, diversified growers will continue to produce these crops in addition to their major crops in order to satisfy certain buyers and niche markets which they have developed.

There are a number of these "minor crops which could have export potential for the future. One example is the bramble crops (raspberry, blackberry) which have generated significant interest among Moroccan growers and are discussed later in this report.

C. CLIMATE AND WEATHER

The climatic conditions of Morocco are suited for commercial production of a wide range of subtropical and temperate species of fruits, vegetables and ornamental crops. Morocco's latitude, topography and location relative to the Mediterranean Sea in the North, the Atlantic Ocean in the West, the Atlas mountain range and large valleys, all interact to produce a wide variety of climatic conditions suitable for the production of many fruit crops ranging from apples and peaches to dates to strawberries and raspberries.

Precipitation

Most precipitation occurs in late fall and continues through winter and early spring. The average rainfall varies greatly among regions and from year to year. Precipitation ranges from less than 100 mm in some areas to more than 1400 mm in others. Thus, low amounts of precipitation and its seasonal distribution make it mandatory to irrigate most commercial horticultural crops. Streamflow from rain and snow melt from the Atlas mountain ranges, coupled with ground water basins along the coastal plains and the central valleys, are the primary water supplies for agricultural irrigation. (insert map)

Temperatures

Along Morocco's Atlantic and Mediterranean coasts, damaging frosts are rare. Temperatures at high elevations are generally low enough to satisfy the chilling requirement of most temperate zone species, however, mild winters at lower elevations lands do not provide

enough chilling for most standard varieties of temperate fruits. Lack of chilling is a limiting factor of fruit production in these locations. Trees grown under such conditions show typical growth symptoms associated with inadequate chilling such as delayed and sporadic bloom and foliation, poor fruit set, low yields and poor quality fruit.

D. SOIL, WATER, AND IRRIGATION

1. Soils

Moroccan soils are characteristic of Mediterranean brown and red soils formed generally from calcareous marine deposits which have weathered under generally low winter rainfall regimes. Aridic and vertic soils are also broadly represented in Morocco's main production zones.

Many Moroccan soils have a high pH ranging from pH 9 to pH 11 or more. At the higher part of this range, many oligo- and micro-nutrients are tightly bound in phosphatic and carbonate compounds. In some tree fruit zones, the resultant lack of calcium causes the development of bitter pit in pears and apples in cold storage.The dominance of alkaline soils also limits the potential for the introduction of acid-loving fruit species, such as blueberries.

The use of localized irrigation systems such as drip and micro-emitters permits acidification through fertilization of the root zone to lower pH and liberation of some oligo-nutrients. Foliar applications of nutrients are frequently recommended for many tree fruits in high soil pH zones.

In some of the sandy coastal soils of the northwestern part of Morocco, lower soil pH is found, due in part to higher average rainfall. Soil pH in these areas may vary from slightly above neutrality to pH 9.

Morocco has nearly 1 million hectares of large-scale irrigation perimeters. It also has well over 250,000 hectares of small and medium-scale irrigation projects, many of which are located in the Atlas piedmont, and which provide a wide spread in temperature regimes. Few areas, even in the mountainous zones, have low enough temperatures to freeze the top soil. There are only few areas where saline soils are a problem. Soil salinity is a localized problem on a few of the older irrigation schemes, where drainage problems in low-lying parts of the systems have developed (Moulouya and Tadla perimeters).

2. Water

Morocco's surface water resources have been the focus of intensive public investment in dams, hydroelectric plants, and large scale irrigation systems since the early 1960's. The quantity of surface water available depends upon winter rains and snow accumulation in the High Atlas. Rainfall is highest in northern Morocco, in the mountainous RIF region, and drops to near zero in the southern provinces and the pre-saharan zone East of the Atlas. As in any semi-arid to arid environment, year to year rainfall variations are high, and droughts are a fact of life. Three of the past four years have been drought years, with water and power rationing.

The citrus, apricot, and fresh vegetable industries were developed in parallel with the expansion of surface water irrigation schemes, beginning in the later 1920's and 1930's. Citrus, banana, vegetable, and avocado production has moved further and further South, to the Souss-Massa river valleys, to take advantage of the warmer winter temperatures. However, this area has one of the higher year-to-year variations in rainfall, and is subject at times to blistering Chergui winds.

Up until this decade, groundwater extraction for agricultural purposes has been relatively limited, except in the coastal areas, where the rapid expansion of the urban population has created competition for surface water supplies. Overdrafts and seawater intrusion has occurred in the coastal zone from El Jadida north to Rabat, and in the Souss Massa where drought and rapid surface area expansion have stretched the supply available from annual recharge of the regions shallow sandy aquifers to the limits. Deeper aquifers are being tapped around the country to permit greater flexibility of water delivery, lower sediment loads for localized irrigation systems supplying greenhouses and orchards, and to supply water to center pivot systems being installed in dryland areas.

Water quality is generally average to good in both surface water and groundwater supplies. Exceptions are in the Northeast (Moulouya basin) where high salt loads push surface water to electrical conductivity to 2-3 mmhos in some areas, and along the central coast, where groundwater supplies may reach 4 mmhos. Increasingly nitrate loading is occurring in river systems, as water transfers and reuse occurs on the surface systems, particularly the Oum Er Rbia, which passes through the Tadla and the Doukkala large-scale irrigation systems. Water pH is generally high, pH of 10-11, which poses substantial carbonate and organocarbonate scale problems in drip irrigation systems. Water corrosivity can be high, which poses a problem for fruit canners who do not employ in-plant water conditioners.

Morocco has a number of thermal springs, some of which are captured for greenhouse heating for winter season production of strawberries and very small quantities of nectarines and peaches.

3. Irrigation

Fruit crops in Morocco require supplementary irrigation in order to maximize plant performance and to obtain highest economic returns. Water availability and adequate chilling are the major limiting factors determining the most suitable areas and fruit crops appropriate for production. The water used to irrigate fruit crops in Morocco comes from dams and weirs, especially in most plantings located at lower elevations in the major valleys of the country.

Upland Soil Irrigation. In most regions, soils with adequate depth and drainage suited for tree fruit culture are found at higher elevations. These upland soils are used successfully for fruit production as long as they are irrigated. Upland soil areas of Morocco must be surveyed for the presence of acquifers suitable for providing irrigation water from deep wells. In a few areas, some growers irrigate from shallow wells, but in most places they irrigate from wells up to 100 m in depth. Fruit crops on steeper upland soils offer higher return for land, labor and capital investment than any other crop or rural enterprise. Of all the factors restricting expansion of fruit production in upland soils in Morocco, lack of

adequate water for irrigation is the most limiting. The infrastructural development of these upland soils should be included in government land programs in order to provide producers with adequate irrigation facilities.

Drip Irrigation. Fruit crops, by nature of their high value per unit area, are better adapted than agronomic crops to modern irrigation techniques such as drip irrigation. Drip irrigation has been shown to reduce water use by up to 60%, particularly when used for tree fruit crops. Moroccan growers, in general favor the use of trickle or drip irrigation. Water used for drip irrigation systems usually comes from wells, canals or rivers. Water from these sources may be treated and/or filtered before it is pumped through the system at very low pressure. The recent trend for Moroccan producers is to combine irrigation and fertilization programs through the use of fertigation.

E. REGIONS OF PRODUCTION

Temperate tree fruit, small fruit and vine crops are grown in seven main regions: Moulouya (Berkane), Sais Valley (Fes-Meknes), Gharb (Kenitra), Tadla (Beni-Mellal), Haouz (Marrakech), Loukkos (Larrache), Souss (Agadir-Taroudant). In addition, there are other pockets of production in specific microclimatic areas throughout Morocco. Expansion of fruit production into new areas will allow for the introduction of new crops, new varieties of currently-produced crops, and the manipulation of marketing seasons through cultural and genetic means. (insert map).

F. TYPICAL PRODUCERS

Moroccan fruit production is characterized by the existence of three types of operations:

1) Small farms traditionally operated at low levels of technology and whose production is generally consumed by the family and/or sold on local markets. These include small surface areas of olives, almonds, dates, apricots, pomegranates, grapes, quince and figs.

2) Small or medium-sized operations which are modernized and characterized by the use of recent technology and higher levels of resource inputs. These growers are exporting some of their crop as well as producing for the local fresh market. Some growers in this group have their own packing and storage facilities. Others may be exporting by selling to a larger organization or by subcontracting for postharvest and marketing services they are unable to provide for themselves such as packaging, freezing, storage, and transportation.

3) Larger corporate organizations which are vertically integrated and operating with the most recent varieties and technology. These are Spanish, French or Moroccan companies which are often highly diversified in growing combinations of fruit, flowers and vegetables. Production is destined for both export and local markets. These organizations are both reactive and proactive with regard to market trends and consumer demands.

In the future it is likely that smaller, independent growers will find it more difficult to compete in export as well as local markets against larger, vertically integrated producers they may, in some cases, depend upon for contract marketing and services. The combination of quality, quantity and diversity of products will determine which producers will compete favorably in many markets. Flexibility in product utilization will also give larger organizations an edge in being better positioned to react to changing markets. For example, this type of flexibility would allow producers to source additional product outside of their own organizations to meet increased demand, or to hold or process product as fresh or processed consumption fluctuated.

II. DESCRIPTION OF THE FRESH FRUIT SUBSECTOR ORGANIZATION

The flow of products in the fresh fruit industry can be presented with the help of a map of the system which takes the products from the production through to the final markets. This highlights the different channels through which product can flow within the overall framework of the subsector. The subsector can be mapped from two perspectives: its structure and the division of tasks. The Subsector Maps, presented in this section try to capture these differences to give us a good idea of the different actors in the sector, to identify the dominant channels, and to highlight the sources of leverage for the subsector as a whole. The first map is a general one for the entire subsector (general fruit subsector), but the next two analyses focus on two important ones which provide insights into other specific crops: strawberries, destined primarily for export, and apples destined for the domestic market.

A. DEFINITION OF THE SUBSECTOR MAPS

1. Functions.

There are a clear set of functions in the fresh fruit fruit subsector, beginning with plant supply - nurseries (either domestic or foreign) flowing through production, harvest (collect) and to the packing house (for the larger growers). From the packing facilities, product can either be put into cold storage, controlled atmsophere storage (as is the case of apples or pears) or shipped straight to the markets (wholesale, retail, or export). The transport function is a very important one for the export markets and really depends on the type of product being exported.

2. Technologies.

Different technologies are used at each of the function levels. The clearest approach is to take them on a function by function basis.

Plant supply: selected plants from certified nurseries, where varieties are guaranteed, general plants, imported plants from foreign breeders. Virtually all of the clean genetic material comes from outside of Morocco, with only limited production of certified plant material in Morocco. Actually, the Moroccan government, through the DPVCTRF has a certification program for olive, citrus, almond, and strawberry plants. Other plants are controlled in the nurseries, but not certified.

Production: small traditional growers, growing primarily for the local market use the elementary production technologies. Small to medium sized growers tend to adopt the technologies developped by the larger integrated growers. For the larger integrated export focused growers, earliness is critical and can lead to the use of plastic tunnels to bring on early flowering and fruit development. It is also dependent on getting the proper mix of varieties which produce at the proper intervals throughout the season, starting with the earliest varieties.

Packing houses: With respect to fresh fruit (as compared to tomatoes), packing house operations are often rudimentary without the necessary quality control for good export quality product. This is most likely due to the heavy concentration on the domestic market, as opposed to an industry developing around exports.

Storage: Cold storage and controlled atmosphere are used for some products in order to preserve them for a periods when the market prices rise. Controlled atmosphere is used primarily for apples and pears, and can hold them for a period of up to 8 months.

3. Markets

While consumption is steadily increasing in Morocco, the marketing of fresh fruit has a relatively simple structure and few differentiated markets. The primary opportunity for marketing most crops is in large city markets. Fruit products are very perishable, and in the absence of sophisticated and integrated methods of storage and transportation, the producer has little control over the timing or marketing of his product. The grower often finds himself at the mercy of the market which is governed by forces of supply and demand outside of his control.

Fruit production tends to varv from year to year due to adverse climatic and cultural conditions such as drought, frost and alternate bearing. Prices fluctuate both seasonally and annually. There is an urgent need for Morocco to focus on methods of controlling these fluctuations in output. Investmenst should be made in the planned development of markets and market information services to minimize the uncertainties of supply and demand. In general, within Morocco, expertise in marketing is minimal. The information available as to the state of most markets is poor, thus, from year to year, uncertainty among producers is high.

The dominant markets for Morocco's fresh fruits are domestic. There are nine formal wholesale markets in the country which account for most of the sales in the large cities. Local produce is sold directly in the retail markets in smaller cities. The main export markets, as seen in the marketing study, are primarily the European countries with very small quantities going to the Middle East and Canada.

Points of Sale. In the domestic market, fruit is sold both in local and wholesale markets. The latter are usually controlled by the town government and/or the county council. Wholesale markets are in principal free markets where prices are generally governed by supply and demand and bargaining between buyer and seller is practiced. The seller may be the producer himself or an agent or broker. Brokers may buy in the field before harvest or from a packing house. Many retailers, dealers and middlemen engage in buying. Market fees are determined by a mixed commission of representatives of town or county councils composed of local authorities and tradesmen. Admission fees vary from market to market and depend on the nature of the commodity being sold. In wholesale markets, produce is usually auctioned and buyers may retail directly or may wrap it and/or store the product in anticipation of higher prices. Product may also be transported to another wholesale or retail market where it may command a better price.

Points of sale in the export markets vary by country. These are discussed in greater depth in Chapter 4, which reviews the international markets for fresh fruit.

Transport. Three kinds of transport are currently being used for the export of fresh fruits and vegetables: refrigerated trucks, boats (either bulk or containerized), and airfreight. The choice of the right mode of transport is dependent on the perishability of the product and the technologies associated with the transport. Controlled atmosphere containers will certainly open up new opportunities for the export of fresh fruit to more distant destinations at affordable costs.

B. GENERAL FRESH FRUIT SUBSECTOR MAP

The first map which is presented is the overall fresh fruit subsector map. From the approximate tonnages which flow through the system, exports account for only a small percentage of the total production.

1. Overview of the major channels

There are two principal channels for fresh fruit production, in general: small holder growers without any packing facilities (channel one) and the large vertically integrated growers (channel 2), who control their product from production through to sale at the wholesale market.

The majority of the product passes through Channel 2, with estimates running up to 80 % of the total volume of fresh fruit (from our products) which is marketed as fresh product in the urban markets. They account for 100 percent of exports. The large vertically integrated growers often have their own varietal trials in place and are adapting varieties from other countries to the local climate. At harvest, they take the product into the packing houses for a quick wash before putting the product in storage. When they are ready to market the product, they bring it out of storage, sort it, and pack it for shipping to the wholesale markets. In some cases they sell directly to the large quantity retailers (semi-wholesellers) such as MAKRO and Marjane.

Much of the product which is produced in Channel One is sold to intermediaries. Many intermediaries harvest the crop, then take it to the wholesale markets where it is sold to the end user (retail outlets) who repacakage it for display. The large growers in channel 2 also buy product from the growers in channel one, to put in their storage or to sort, pack and sell at the wholsale markets.

2. Production and Postharvest Handling

The production techniques and varieties for each of the major fruit crops are analysed in the following sections. Several key points stand out: nurseries and plant material, packing houses and cold/controlled atmosphere storage .

Nurseries. First is the availability of adapted plant material from nurseries. There are 590 licensed nurseries in Morocco, producing about 43 million plants of different species. Of

these only a handful are serious, large nurseries. The government has a certification program for four commodities - almonds, olives, citrus, and strawberries. The other commodities are controlled at the nursery for phytosanitary problems. Actually, seven nurseries are certified for almond plants, six nurseries for citrus, two for strawberries, and about forty nurseries for olives.

Fruit tree nursery prices vary according to availability and demand. Examples of comparative prices among fruit tree species produced in Morocco by SO.DE.A. are listed in Table 4. For example, the high price of cherry plants is due to high demand for plants, especially by small growers of 1 to 5 hectares in the Azrou Immouzzer and Ain Leuh areas where increasing acreages are planted every year. High demand for plants and expansion of cherry plantings can be explained by the increase in demand for local market fruit and by their low cost production. Cherry has gained the reputation of being the tree of the poor as it requires less care and has a guaranteed market. Most smaller growers sell the crop on the tree and do not have to deal with harvest and marketing problems.

Table 4. Price of fruit tree plants sold by SO.DE.A. in 1993.

Species	Price (Dh)
Cherry	35
Apple	18
Pear	16
Quince	14
Loquat	17
Peach	10
Almond	8
Grapes	10

Cold/Controlled Atmosphere Storage. Cold storage either at the packing house or in the markets is an important, indeed critical, element for lengthening the preservation period of the product and enhancing its marketability. For export, the ability to rapidly bring down the temperature of the product and keep it steady is critical. There are xx cold storage chambers around the country

There are 6 controlled atmosphere storage facilities with a total of 35,000 m3 of storage space, equivalent to about 6,000 tons of fresh produce storage. The stations are located in Berkane, Casablanca, Khemisset, Agadir (Ait Melloul), Ait Harzallah, et Sidi Brahim. Annex Eleven provides a detailed breakdown of the number of refrigeration units in Morocco. These are used primarily for apples and pears.

The only wholesale market which currently has cold storage is Casablanca.

Ownership of the cold storage areas is primarily in the hands of the private sector. There are only eleven government owned cold storage areas, five of which belong to the

SOCAMAR[3], part of the OCE. The MAMVA owns three cold storage units, but has them leased under private management, and the Commune of Casablanca owns the RAFC.

Table 5 presents the total regional and unitary breakdown of the number of storage chambers by category (controlled atmosphere, 0 degree and negative, 0 degrees and positive, as well as the estimated amount dedicated to fresh fruit and vegetables). Annex eleven present greater breakdowns of the ownership, distribution by size, uses of the storage units and the Freezing capacity in the country.

Table no. 5: Storage in Morocco and Capacity Dedicated to Fresh Produce

Region Economique	No of Controlled Atmosphere Chambers	No. of 0 positive cold storage chambers	No. of 0 negative cold storage chambers	Capacity for Fruits and Vegetables
Sud	6	184	75	40,105
Tensift	0	58	37	2,353
Centre	4	549	79	72,218
Nord Ouest	3	142	64	25,567
Centre Nord	2	93	3	15,000
Oriental	3	62	10	16,721
Centre Sud	5	260	4	57,750
TOTAL	23	1348	272	229,714

Source: MAMVA

The number of Cold Storage areas is broken out by capacity of the station. Stations under 500 m3 are primarily at the packing house. Precooling, which is a fundamental step for improving the lifespan of the fresh fruit, is virtually non-existant in Morocco.

Packing. Product passing through channel one rarely sees a packing house and is never repackaged. Most product passing through channel two goes to the packing house where it is cleaned, and properly packaged.

Local Transport. Transport for the local market is done almost entirely in small trucks, 7 tons and smaller.

3. Marketing and Prices

The key point in the domestic marketing is the wholesale market. There are roughly nine major wholesale markets in Morocco, and then many smaller ones. Of the nine major

[3]Oualidia, Casablanca, Tanger, Berkane, and Agadir

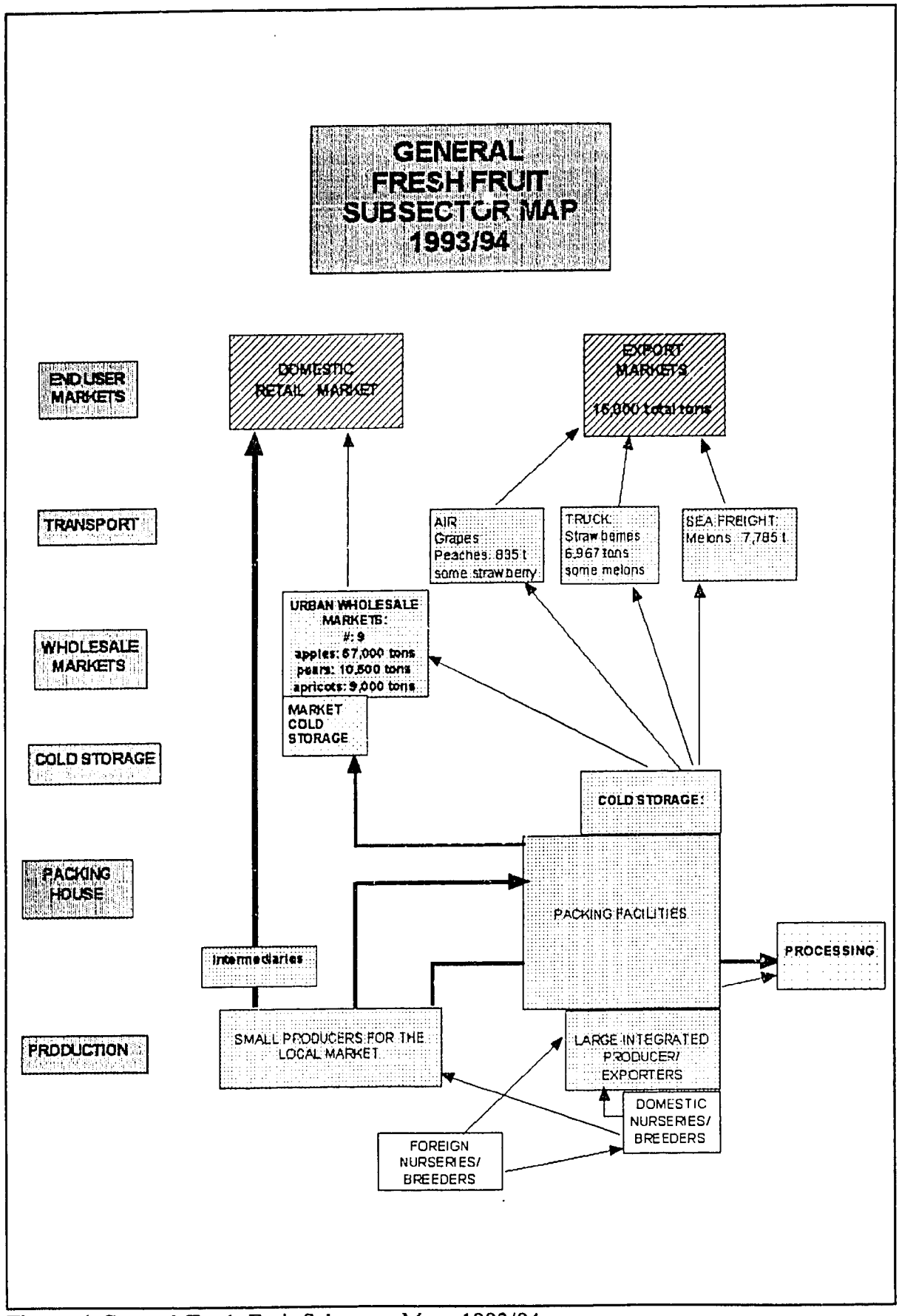


Figure 1 General Fresh Fruit Subsector Map, 1993/94

markets, however, the Casablanca wholesale market stands out as the primary point of sale for most products since it is in the major market of the country. Many semi-wholesalers who work in the secondary wholesale markets buy their product at the wholesale market in Casablanca and then resell it to retailers in the smaller wholesale markets. Other large wholesalers from Casablanca, may buy some of their product in the regional markets (such at Ait Melloul) and then resell it in Casablanca.

The DPAE collects statistics on some products passing through the six major wholesale markets (Ait Melloul, Casablanca, Kenitra, Rabat, Fes, and Marrakech). These are considered to be representative of the total since Meknes is close to Fes, Tetouan is very isolated and Tanger is a smaller market. The DPAE statistics, collected on apples, pears, peaches, and apricots reveal the following flow of product.

Table 6: Wholesale Market Sales (1992-93)

Products	1992 Tons	1993 Tons	1994 tons (or % of '93 sales to date)	% Casablanca
Apples	61,512	57,287	120%	
Pears	9,327	10,515	72%	
Peaches	6,445	6,723	6,332	
Apricots	8,055	11,225	8,985	

Source: DPAE

Prices naturally vary by season for the fresh product. Annex 8 provides a breakdown of the seasonal availability and price variation over the course of the year for pears, a product which can be made available over the entire year due to storage capabilities. Apricots and peaches, which cannot be preserved for a long time are essentially available on the local market during the months when they are harvested: May - August for peaches and late April to June for apricots.

4. Export Transport

The transport for the majority of products is handled by air (peaches, grapes, nectarines, cherries, apricots), but the greatest tonnage is transported by refrigerated truck (strawberries and melons).

The two following sections will address specific products in the overall Subsector - strawberries which are primarily for export, and apples which are primarily for the local market.

C. STRAWBERRY SUBSECTOR

Unlike most of the other products in this subsector, which are tree or vine fruits with long development periods, strawberries are an annual crop. This factor has meshed with the strong export demand to drive the development of the strawberry subsector as a major industry for Morocco over the last 5 years. The thesis done by Lahlou, at the IAV, published in September 1994 provides the most accurate information on the subsector to date.[4] The annex five, on Strawberry Production, provides more in-depth information on types of plants, varieties, and production technologies. In addition, a separate publication, regrouping the information presented in this document and the marketing and production studies, is available.

1. Overview of the channels

The strawberry subsector map reveals dual channels of vertically integrated producer-exporters. In the north we find the combination of production for fresh and for processed (frozen either in IQF, block or semi block). These growers have a minimum of 30 ha. On production of 40-50 tons/ha, about 50% goes for the fresh export, 25 % for the local market and 25% for the frozen processing industry.

In the South, we find the large vertically integrated growers (exporting groups) beginning to be interested in the product. They can be on the market earlier and capture the peak prices. These growers also have at least 30 hectares. Of their yields of about 40-50 tons, about 50 % goes for export, 30-40 % for the local market, and the remainder to processing plants for jams and other products. There are no freezing plants in the South which specialize in fruits and vegetables, so freezing has not yet become a viable option, though the larger growers are now installing static freezing chambers, or investigating the possibility of installing fixed or mobile IQF plants.

In addition to the two major channels, there are the small growers who produce almost exclusively for the local fresh market. These growers tend to be in the North between Kenitra and Larache and supply the Rabat and Casablanca markets. One or two of the small growers have succeeded in exporting by latching on to a larger grower-exporters logistic services. Some of their production is now being targetted towards the frozen strawberry industry.

There are three general ownership structures for the firms in the Moroccan Strawberry subsector.

- Moroccan growers with limited plantings growing primarily for local markets, some of whom can sell part of their product for export (channel two).
- Moroccan growers partnered with French or Spanish companies who produce primarily for fresh and frozen export (channel one or three).

---

[4] *Etude des Différents Itinéraires Techniques de la Culture de Fraisier, Axe Rabat-Larache*, Mr. Lahlou Kassi Kamal, September 1994.

- Spanish or French companies producing strawberries in Morocco (channel one or three) primarily for export.

Foreign producers have moved here in search of a good climate, available land and reduced labor costs. With regard to climate, one highly experienced Spanish grower said that, compared to Spain, Morocco has a superior climate for strawberry production. With land rental costs at $275-330 US per hectare, land is relatively available and inexpensive. Agricultural labor costs in Morocco ($3.50-4.00 US\day) are ten percent less than similar labor in Spain.

2. Production and processing

Supply of plants: Growers plant between 60,000 and 100,000 plants per hectare depending on their technology, markets and access to plants. With about 1,000 ha of strawberry planted in 1993/94, this means there was a total requirement of about 80 million plants. The 1994/95 season will require even more. Spain is the major supplier of plants, both frigo[5] and fresh. The two main local suppliers of strawberry plants are the Pepinieristes Associés and the SODEA. Between them, they account for 5,500,000 certified plants, 25 percent of which are foundation plants and 75 percent were certified for planting.

Given the large quantities they are ordering, the larger growers can get a good supply of fresh or frigo plants from Spain. The smaller growers are less able to order plants from Spain and depend on local market supply.

There is a preference for the fresh plants among the large growers because they can deliver an earlier product.

Varieties: The dominant varieties grown in Morocco are the Osso Grande and Chandler. Other varieties include Senga Sengana, Tudela, Selva, Douglas, Parker and Pajaro.

Harvest dates: This is the most critical element for the producers, since those harvesting earliest capture the highest prices. Some production begins in January, but the majority comes on in February. Cut-off dates for the harvesting are generally caused by the drop in export prices beginning in April. However those producing for IQF can maintain full production into July.

Yields: Growers in channels one and three reach yields of 40-50 tons/ha, while the small growers in Channel two have lower yields of between 25-35 tons.

Processing/Freezing Technologies. There are three major freezing technologies in use by the processors in Channel One: Individually Quick Frozen (IQF) semi-block, and block. Companies which are primarily growers and who have diversified into freezing, such as

---

[5]Frigo strawberry plants are ones that have been dug and placed in cold storage to induce dormancy. They require more time after planting to yield fruit. Fresh plants are transplanted directly and can start yielding much sooner.

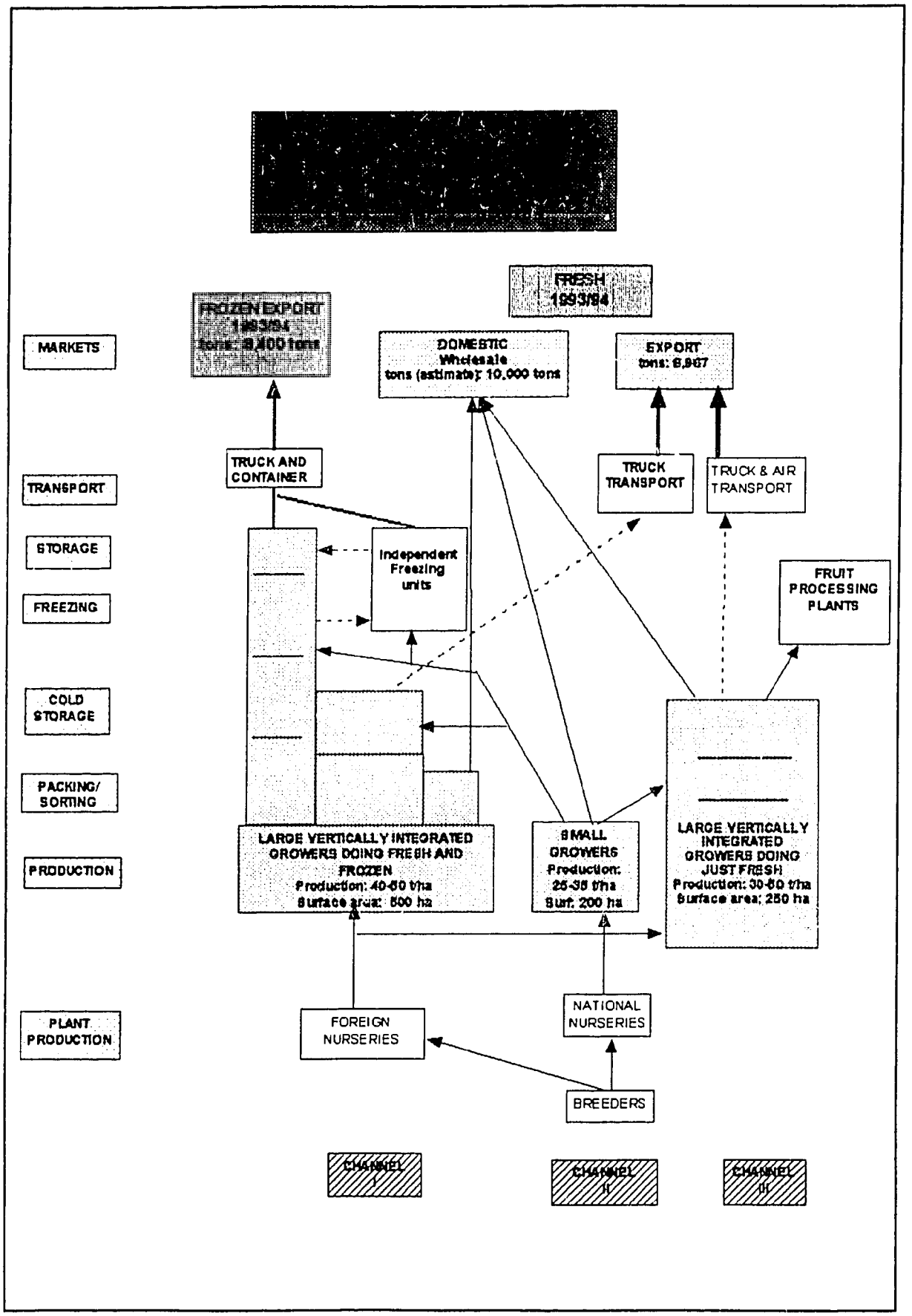


Figure 2 Strawberry Subsector, base map

Alconera, tend to have static freezing operations (using freezing rooms), the alterantive requiring the lowest initial investment but delivering a slightly lower quality product.

The IQF operations (see Processed Fruit and Vegetable Subsector Study, MAPP-12) tend to be in fixed plants which began in order to meet the needs of the green bean industry. Most of these are 750 kg/hr lines, though there is now at least one 2000 kg/hr line in Larache.

3. Costs and Returns

Costs. Independent of long term fixed costs, a rough budget for seasonal production of one hypothetical hectare of 'Chandler' strawberries north of Kenitra in the two row, raised bed system with black plastic mulch and plastic tunnels would be similar to the example below:

Table 7: Establishment Costs for one hectare of Strawberries (in U.S. $)

OPERATION	TOTAL VALUE
Land Rental	300
Plants	8,400
Drip Irrigation	2,300
Plastic tunnels	2,500
Fertilizers and Pesticides	900
Labor	4,600
Miscellaneous	1,000
Total Cost/ha	**$20,000**

The prices provided in the following paragraphs reflect information provided to the researchers by major growers and information provided Lahlou. Prices are ex-farm (transfer prices) and do not include transport costs.

Fresh Export Prices. The large integrated growers send their best product for export. In the North, channel one growers get prices averaging 11.5 dh for export while those in the South (Channel three), who are on and off the market earlier, average closer to 14 dh/kg.

Fresh Domestic Prices. The small growers, who send their best product to the local market averaged about 6.5 dh/kg[6], while the integrated growers from the South appear to have averaged about 4-4.5 dh/kg, since this was their second quality product. In the North, the growers in Channel One sent their third quality strawberries to the local market, getting average prices of about 2.5 dh/kg[7].

Processing Prices. The large growers in Channel One produce expecting to process (freeze) the harvest for the latter part of the season. In the North, 1994 prices were quoted as 3.5 dh (ex-farm), for freezing, thought these will probably increase to 4 dh/kg for the 1995

[6]ibid

[7]ibid

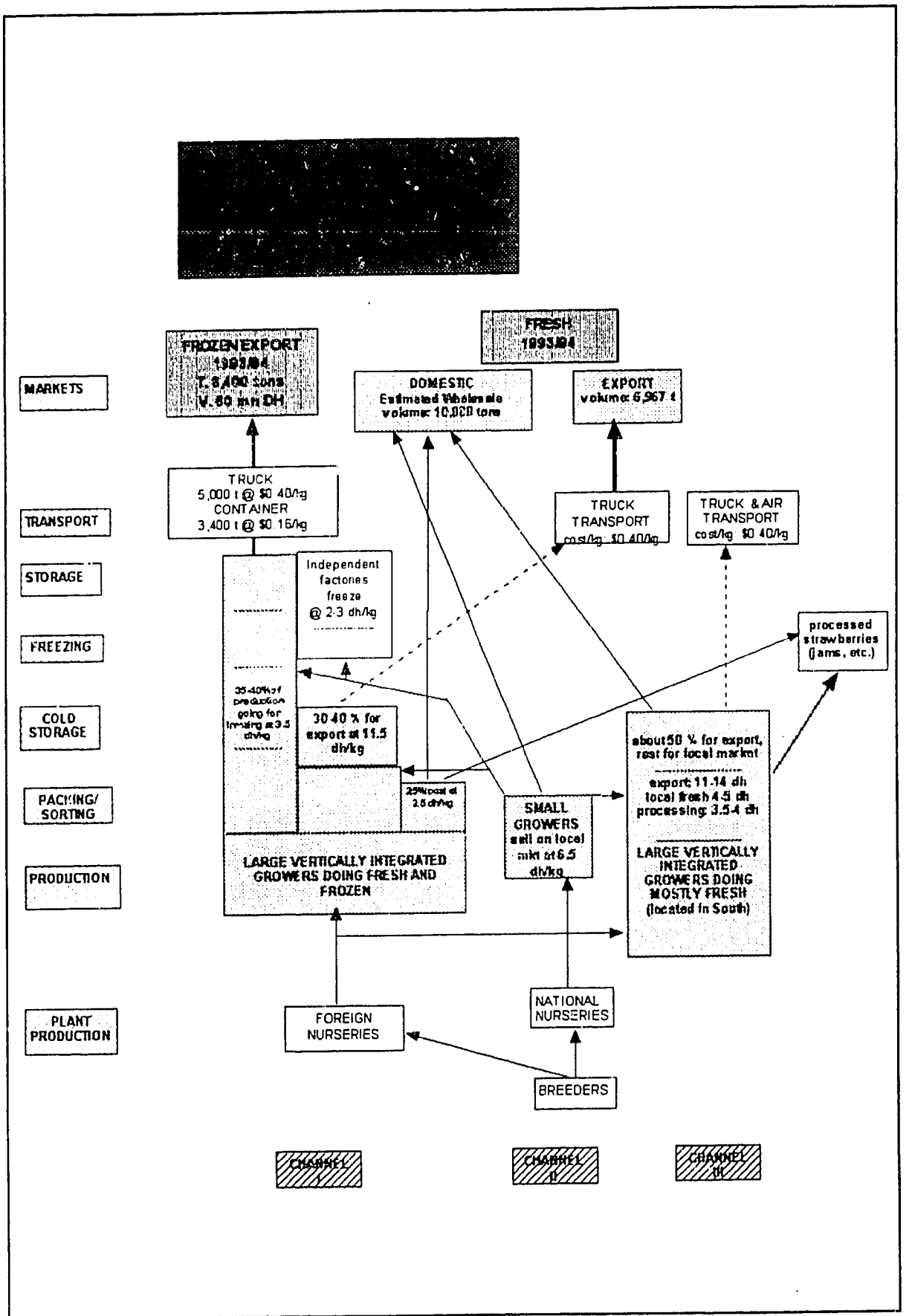


Figure 3 Strawberry Volume and Value Map

season. In the South, growers who sent product to the processing plants (jam and canning) received between 3.5 and 4 dh/kg (average of about 3.8 dh/kg).

In 1994, frozen strawberries were selling for about FF 5.50, at the freezing plant door for semi block.

Table 8: Approximate Profitability of Fresh Strawberry Production in Morocco (40 tons production)

OPERATION	TOTAL VALUE
Production/harvest Costs	$20,000
Handling/Packing/Shipping	$10,000
Sales Revenue - export	$25,000
Sales Revenue - freezing	$5,000
Sales Revenue - local	$5,000
Profitability	**$5,000**

4. Transport

Transport plays a major role in the structure of the industry. A full refrigerated truck of strawberries can carry about twelve tons. With the cost running at 30,000 FF for a truck from Agadir and 25,000 FF for a truck from Casablanca to Perpignan, the cost of shipping this product comes to between 2 and 2.5 FF/kg (3.2 and 4 dh/kg), depending on point of departure and destination. This means that the cost of transport is approximately equal to the value of the fruit at the farm.

For Frozen Strawberries, there are few more options and containers for seafreight have been provided by MAERSK for the largest single export of the product, which was by BGSN (a broker) to UREN in the U.K. The cost of a 40 foot reefer container to the U.K was $3200 for about 20 tons, for a transport cost of $0.16/kg to the U.K.. For transport to European mainland markets, the cost is $0.15/kg for a reefer container since the containers are allowed to carrt heavier loads. This is substantially cheaper than the cost of trucking fresh strawberries directly to Europe, which costs about $0.40-50/kg, as per above.

5. Driving Forces

In addition to being an annual crop and the large overall market demand, there are three major driving forces in the subsector:

a. The plants for planting. Morocco is currently dependent on Spain for between 80% and 90% of its plants. Plant production is a very profitable activity and is at the root of the success of a farm. There is clearly a potential for increasing sales of strawberry plants (either fresh or frigo plants) to the growers. With only about 10-15 million plants being sold from domestic nurseries, there are about 70 million plants being imported, primarily from Spain. Shortage of plants from Spain could lead to an involuntary shrinking of the Moroccan industry. Poor quality plants from Spain could also seriously hurt the industry.

b. Transport. Transport is a major driving force in the subsector because the size of the farms is determined on the ability to ship the product cost effectively to the export markets. For fresh strawberry exports, it takes at least 30 hectares of production to be able to fill up a refrigerated truck. This naturally directs the industry into the hands of larger growers, employing large numbers of people.

c. The Markets. The earlier product is available in the season, the higher the price it captures. The entire industry is focused on getting its product out as early as possible. Harvest dates have moved forward steadily into January for plants which are planted fresh in October and then covered in plastic tunnels. The varieties selected are an important part of achieveing the earliness.

The location of freezing capacity has also been an important force in the development of this subsector. There is now (beginning January 1995) only one dedicated fresh fruit freezing unit in the South, so nearly all product must be exported fresh, limiting the production to the large fresh produce exporters (in 1994, some product was trucked to Safi for freezing and holding for further processing). In the North, there are many freezing units available, but only a couple which specialize in strawberries. Others are becoming interested however, and are beginning to contract for production. Freezing opens up two major opportunities: extending the season and providing a market for small growers.

Since most of the frozen strawberry is done in May, June and July after the fresh market has begun to collapse, it lets growers amortize their fixed costs with greater tonnage. Second, it can be profitable to small growers as well as for the large growers, allowing a small grower to begin with a couple of hectares, and possibly grow. Freezing also allows for the use of different kinds of transport, such as frozen container shipped by sea which cost less.

D. APPLE MAP

The apple subsector functions very similarly to the general fresh fruit subsector presented above, except that it is exclusively for the local market. Morocco does not export any apples because their costs of production are high, the quality is low, and the local market prices are more interesting than international prices. The use of controlled atmosphere storage allows the product to be sold gradually throughout the year, thereby reducing the glut on the market during the fresh season and allowing the marketers to capture higher prices the year round.

1. Overview of the Major Channels

As with the General Fruit Subsector map, there are two primary channels in the Apple Subsector - vertically integrated growers (channel 2) who supply the wholesale markets on a year long basis and smaller growers (channel one) who sell directly at the local markets, ship to the wholesale markets for direct sale, or sell to the growers in channel 2 who can store the apples for later sale.

As noted above, the presence of the controlled atmosphere storage is the dominant determinant in the structure of this sector. The six controlled atmosphere storage units are in Channel two and are integrated with production. The owners of the CA storage will fill

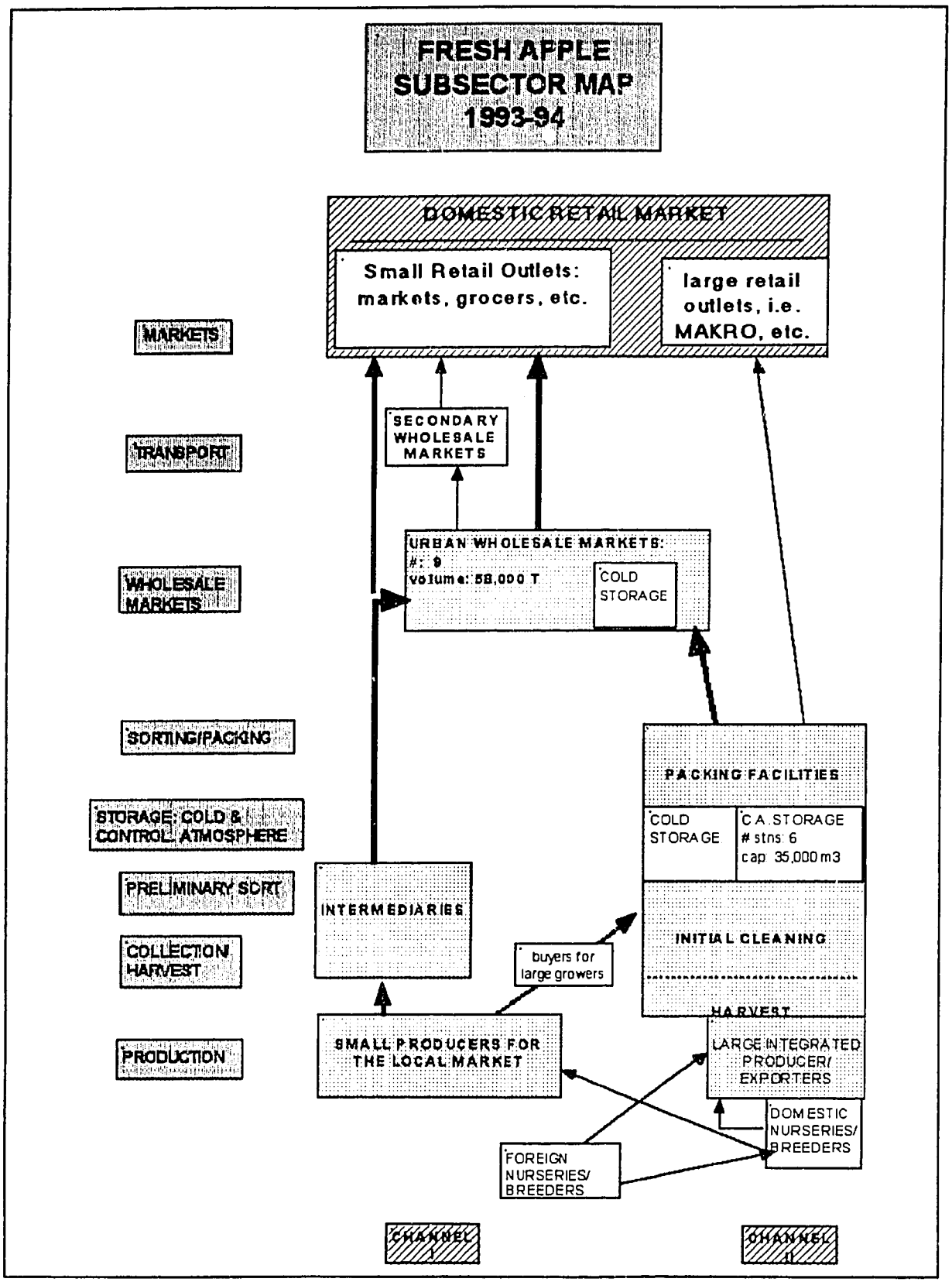


Figure 4 Fresh Apple Subsector Map

the storage with their own production and then will purchase additional product to fill any

shortages.

2. Production

In terms of acreage and production, apples are second only to almonds in importance among the Rosaceous species. Late varieties are concentrated at higher elevations and production is stored for 4 to 6 months before it is marketed. Early and mid-season varieties are produced at lower elevations and production is marketed immediately or soon after harvest. Certain varieties are grown in both areas. Typical of such varieties is 'Golden Delicious' which is known for its adaptability. The yield and quality obtained with this variety at lower elevation are much less than for production at higher elevation.

Varieties. The main apple varieties commercially grown in Morocco include:

Llorka	Anna	Ein Shemer	Dorsett Golden
Gala	Royal Gala	Jerseymac	Ozark Gold Vista
Bella	Jonnee	Golden	Delicious Golden
Smoothee	Belgolden	Lysgolden	Red Chief
Top Red	Redone	Starking Delicious	Strakrimson

Early season production. Growers have a strong interest in growing apples at lower elevations for early local markets. Apples were grown initially at higher elevations and have moved progressively to lower elevations as the local market showed promise and the crop was profitable. The standard varieties were not necessarily suited for these areas where the winters are mild and do not provide adequate chilling to reach full production potential. As low chill apple varieties became available the interest of expanding the region of production became greater and apple production moved to even lower elevations and latitudes as well. The objective of the growers was to be on the market early so that high profits could be obtained, even though yields are relatively low, a general characteristic of early varieties. This early production had the advantage of filling the gap between the previous season's crop in storage and the current season's next crop of standard varieties. Some of these early varieties showed considerable potential and have been widely planted in Meknes, Gharb, Marrakech, Beni Mellal and Taroudant.

The most interesting early season (low chilling) varieties currently grown include: ***Anna***, ***Ein Shemer***, and ***Dorsett Golden***

Growers in higher altitudes have been looking for varieties with good quality and storage characteristics. The objective is to diversify and find varieties other than standard red and yellow Golden Delicious and its mutants. Examples of varieties such as these include: **Red Miracle**, **Mutsu**, **Fuji**, and **Braeburn**. The ***Hidala Hillwell Braeburn*** has excellent taste, firm flesh and a long life storage.

Production problems. The major production problem for apple is the lack of chilling for standard apple cultivars at low elevations. Lack of chilling induces prolonged dormancy and delays foliation and flowering, causes poor bud break and in general results in low yields and poor quality fruit. Varieties with high chilling requirements should be confined to higher altitudes where they can receive sufficient chilling and express their full potential.

2. Marketing and Prices

Even with the capacity to store apples and pears over the course of the winter, their availability and cost follow fairly regular and cyclacle patterns. The two figures in annex 12 present the supply and cost of two years of production over the course of the years 1992 and 1993. Prices begin their upward climb in December and reach their peak prices just befor the new harvest comes in May.

Costs and returns. The detailed analysis for this section is found in annex 3.

The estimated establishment costs for a hectare of apples:	75,000 dh
The estimated production costs for a hecatre of apples:	34,000
The average yield per hectare (early varieties):	30 T
The average yield per hectare (late varieties):	40 T

General Costs and Returns

Table 9: Profitability of Early and Late Varieties

ITEM	LATE VARIETY COST	EARLY VARIETY COST
Cost of Production	34,000	28,850
Packing/Handling/ Transport	68,000	5,150
Revenue	180,000	90,000
Profitability	**78,000**	**56,000**

5. Driving Forces

Local market demand has been the driving force in the apple subsector. This demand has driven the steady increase in production, which will provably eventually saturate the local market. A second driving force in the subsector is the availability of clean plant material which is adapted to the Moroccan climate. It is not known at what point in time the market will become saturated with apples, dropping the sales price even lower in the peak production period. But as long as the controlled atmsophere storage capacity remains constant, prices will remain high in the off season, see below.

The second key driving force here is the controlled atmosphere storage, which allows the growers to hold their stock from harvest and to capture the major gains in the higher prices later in the season reaching more tha 7 dh/kg in March - May of 1992 and 6.5 dh/kg over that same period in 1993. The 1994 wholesale market prices were a little lower in March, but peaked above 7 dh/kg in May. For apples the cost of this service is approximately 0.15 DH/kg per month. This makes the added cost of storage about 1 dh/kg against an increase in price of 2-3 dh/kg.

III. OVERVIEW OF OTHER FRUIT CROPS PRODUCT BY PRODUCT ANALYSIS

The discussion on a product by product basis below are kept intentionnally short. More detailed information can be found in annex three for profitability calculations, annex four for more information on varieties, and annex seven for the production techniques by product. Strawberries, grapes, and

A. PEACH AND NECTARINE PRODUCTION

1. Background

Low chilling peaches and nectarines are of great interest to Moroccan growers. These varieties will extend fruit production to lower elevations and produce early fruit which can be exported.

2. Varieties

The major peach varieties commercially grown in Morocco include:

Sprincrest	Maycrest	Starlite	Dixired
Redhaven	Springtime	Redtop	July Lady
Suncrest	Calred	Merril O Henry	Early Maycrest
Redwing	Spring Gold	Starcrest	Desertgold
Robin	Starcrest	Flavorcrest	Springcrest
Spring Lady			

The major nectarines varieties commercially grown in Morocco include:

Arking	Maygrand	Early Sun Grand	Sun Grand
Independence	Red Diamond	Maria Laura	Katia
Fairlane	Fantasia	Stark Red Gold	Sunred
Mayred	Snowqueen		

3. Early season varieties

Listed below are cultivars that were developed for subtropical climates. Some are already grown in Morocco, but information on their adaptation here is limited as, in general, growers are unwilling to share their experiences with promising early varieties. This is due to a strong fear of increasing competition in an already competitive market. The varieties are described in annex 4. This information was developed through data gathered from trials

conducted in Florida and Texas and through contacts with private growers who were kind enough to discuss in detail their experiences with low chilling peaches.

Low Chill Peach Varieties

Flordaprince	Flordabelle	Earligrande	Desertgold.
Flordagold	San Pedro	Flordaking	RioGrande
FlordaGrande		TropicSweet	TropicBeauty
Flordadawn	Flordaglobe	Flordaglo	TropicSnow.

Low Chill Nectarine Varieties

Sunred.	9-12	5-14	5-15
Sunfire.	Sunlite	Sunripe	Sunhome.
Sungem.	Sundollar	Sunblaze	

4. Costs and returns

Details for the cost and return analysis are found in annex 3. Calculations for the profitability of different varieties of peaches are found in Annex Three. On a per hectare basis, they vary between 60,000 and 65,000 dh for local market production.

Estimated average establishment costs:	62,000 DH
Estimated average production costs:	21,000 DH
average yields:	

Table 10: Profitability of Export market production Peaches

ITEM	COST
Cost of Production	21,000
Handling/packing/ transport for export	24,480
Handling/packing/ transport for Domestic	8,100
Sales Revenue for Export	144,000
Sales Revenue Domestic	37,800
Profit	**124,220**

Table 11: Profitability of Early and Late Peach Production for the Local Market

ITEM	COST OF LATE PEACH VARIETIES	COST OF EARLY PEACH VARIETIES
Cost of Production	21,000	21,000
Handling/packing/ transport	12,500	9,000
Sales Revenue[8]	100,000	90,000
Profit	**66,500**	**60,000**

B. PEAR PRODUCTION

1. Varieties

The major pear varieties commercially grown in Morocco include:

Precoce de Morettini	Santa Maria	Passe Crassane	Grand Champion
Clapp's Favorite	Williams	Beurre Hardy	Hiland
Conference	Beurre Bosc	Packham's Triumph	General Leclerc
Doyenne du Comice	Beurre d'Anjou		Docteur Jules Guyot

The variety Passe Crassane is the latest in ripening and the variety stored longest. The major problem for world pear production is fireblight, which fortunately does not yet exist in Morocco. Every effort should be made to prevent the introduction of this pest into the Moroccan industry. As a protective measure, it is illegal to import the Passe Crassane variety which is very susceptible to fireblight. Most of Moroccan pear production is confined to high elevations.

3. Low chill pear varieties

Some pear varieties have low chilling requirements and are generally satisfactory for areas with mild winters. The varieties listed in annex four are adapted to warm climates and are fireblight-resistant. All have a very low chilling requirement for pear at only 150 hours.

4. General Costs and Returns

Establishment Costs for a hectare: 70,000
Costs of Production for a hectare: 32,000
yield per hectare 30 Tons

---

[8]*Note: Very late varieties may be sold for higher prices and thus the profit margin will be greater.*

Table 12: Profitability of Fresh and Stored Pear Production

ITEM	COST OF STORED PEARS	COST OF FRESH PEARS
Cost of Production	33,000	32,000
Handling/packing/transport	25,650	
Losses During Storage	3,300	
Storage Cost	22,500	
Sales Revenue	148,500	75,000
Profit	**64,050**	**43,000**

C. SWEET CHERRY PRODUCTION

The cherry industry is located primarily in the areas around Sefrou, Immouzer, Azrou and Ain Leuh. Most cherry varieties commercially grown in Morocco have high chilling requirements and are grown at higher elevations where they will be most productive.

1. Varieties

The main varieties grown commercially in Morocco are:

Burlat	Moreau	Marmotte	Van
Sue	Summit	Victoria	Ulster
Napoleon	Stark Hardy Giant	Geant d'Hedelfingen	

Among these varieties, Burlat is the earliest ripening cultivar and is harvested in mid-May. Moreau ripens in nearly the same period.

a. Low chilling, early season varieties

There is a need for low chilling varieties in order to expand the area of sweet cherry production to lower elevations and obtain early production for potential export markets.

Two varieties which should be tested in Morocco are promising because of their earliness, quality and reduced chilling requirements are the: **Precoce Bernard**, and the **Marvin^{R}Niram**.

Other interesting varieties are **Stella** and **Sunburst**.

2. Costs and returns

The detailed analysis for these costs is presented in annex 3.

Estimated establishment costs for a hectare of cherries:	65,000 DH
Estimated production costs for a hectare of cherries:	18,000 DH
Average yield per hectare:	20 T/ha

Table 13: Cherries produced for the Export and Domestic markets.

ITEM	COST
Cost of Production	18,000
Handling/packing/ transport domestic	11,250
Handling/packing/transport export	52,500
Sales export sales domestic	125,000 60,000
Profit	**103,250**

The margin profit will depend largely on yield and the portion of the crop that is exported. However, sweet cherry remains a very profitable crop, even for local market. A grower in the Azrou area sold 3 hectares of crop on the tree for 320,000 Dh or an average of 106,667 dh/ha. Even with a production cost of 18,000 Dh/ha, and even though harvest cost in this case is at the expense of the buyer, cherries gave this grower a return of more than 88,000 Dh/ha.

D. PLUM PRODUCTION

1. Industry overview

Moroccan plum production is concentrated in the areas of Chefchaouen, Ouezzane Meknes, Marrakech and Kenitra. Industry expansion is seen in the Gharb and Khemisset area. Much of the plum production goes for dried prunes.

2. Varieties

Japanese Plums
The most important Japanese plum (*Prunus salicina*) varieties grown in Morocco are **Santa Rosa**, **Methley** and **Golden Japan**. Japanese plum varieties differ considerably in size, shape, skin color, flesh color, texture, and season of ripening. In addition to these older Japanese plum varieties, two newer have been introduced and produced commercially. **Blackamber**, a large black plum, has gained rapid consumer acceptance. The fruit has a flat shape, black skin and white flesh which ripens in mid-June in Morocco. **Angeleno** is a late plum variety with flat shaped fruit, black skin and ripens in early September.

Early varieties which may be of interest for Moroccan growers include **Red Beaut** and **Spring Beaut** which may ripen in Morocco in early to mid May. **Red Beaut** (450 hours) has red skin and yellow flesh but may be difficult to pollinate.

European Plums
The most important European (*Prunus domestica*) plum variety in Morocco is **Stanley**. This is an excellent variety which well adapted to Moroccan climates. Consistently productive, this variety is self-fruitful, with large fruit (30 to 40 g), good flesh firmness, dark red purple skin, yellow flesh, good quality and high soluble solids content. Its high soluble solids, firmness and physical resistance to handling and transportation make the fruit suitable for fresh eating and drying.

It appears that the number of Japanese plum varieties in Morocco is very limited and consists mainly of older varieties. In California there at least 20 plum varieties grown commercially and at least 30 additional varieties grown on limited acreage. In Morocco there is a strong need to identify new varieties, especially early red and black varieties with large size, good color, firm flesh, consistent production and with good shipping characteristics.

A number of promising genotypes that would be worthy of trial under Moroccan conditions include:

3-4 8-1 8-2 315-22 315-24

3. Costs and returns

The detailed analysis for the cost analysis is found in annex 3. The average yield per hectare is estimated at 15 tons.

Table 14: Return on the investment in a hectare of plums for prunes

ITEM	COST
Cost of Production	14,000
drying Prunes	15,000
Handling/packing/ transport	5,000
Sales Revenue	100,000
Profit	**66,000**

E. APRICOT PRODUCTION

1. Industry overview

Moroccan apricot production is concentrated in the areas of Marrakech, the El Kelaa area, Ouarzazate and Berkane. The area of Marrakech and El Kelaa accounts for more than 70% of Moroccan apricot acreage and production.

2. Varieties

The two major commercial apricot varieties in Morocco are Maoui and Canino. Canino represents 70 to 80% of all apricot acreage in Morocco and is grown primarily for processing. Meanwhile, Maoui is grown primarily for fresh consumption,

The dependency of the apricot industry on a single variety has lead to several problems. The ripening period of this variety is narrow and with all of the production occurring in a short period of time, the processing plants are overwhelmed, unable to process all of the fruit and prices drop dramatically. The other problem is that apricots appear in local markets for no more than 3-4 weeks. There is a need for early, medium and late varieties to lengthen the season, increase marketing opportunities and to stabilize prices.

Several local apricots (most of which are seedlings) are grown in different areas of Morocco, especially in oases. In an attempt to lengthen the harvest period of apricots, INRA has evaluated a number of cultivars which have the potential to extend the season: **Hamidi**, **Del patriarca**, and **Royal/Blenheim**.

Two low chill apricots developed in California may be worthy of trial in the warmer areas of Morocco: **Mesa #1**, and **Mesa #2**.

Seedling populations of apricots in Morocco may contain interesting ecotypes with good fruit quality, shipping potential, pest resistance or drought tolerance. A program for the collection and selection of elite apricot types should lead to the identification of ecotypes that could be used commercially or in a breeding program for the development of specific traits.

4. Costs and Returns

Establishment Costs	20,000
Average Yield per Hectare:	15 Tons

Table 15: Profitability of Apricot production for Fresh Domestic Market and Processing

ITEM	FRESH MARKET APRICOTS	PROCESSING APRICOTS
Cost of Production	11,000	11,000
Handling	4,050	1,050
Sales Revenue	37,500	22,500
Profit	**22,450**	**10,500**

In addition to the tree fruits, Morocco has several major, traditional products and a few newer fruit products: grapes, melons, strawberries, fraise des bois, other caneberries. These products usually offer important advantages over the tree fruits by requiring less time to mature and become exportable. This allows producers to get in and out of them more quickly, an element which can have an important impact ofr the effectiveness of the project.

F. GRAPE PRODUCTION

1. Background

The grape industry plays an important social and economic role within the Moroccan fruit industry. It has already been analyzed quite thoroughly in the Wine Subsector Study[9] and is presented in Annex Six. It provides approximately 5.2 million days of employment each year in production as well as processing. This sector also generates significant revenue through the exportation of wine. With an acreage of 49,800 ha, grapes occupy about 6.4% of land planted in fruit. Of the surface area in grape production, 75% is table grapes and 25% in wine grapes.

While wine and table grapes grow in close proximity to one another, they represent two distinct industries. While both industries depend on the same genus of plant, they utilize different varieties and employ distinctly different cultural management and training systems. In Morocco, these products, their uses and their markets are different:

Table Grapes: The table grape is a perishable fresh fruit which has a high added value and competes with other summer fruits; it is not exported and has no competition from imports.

Wine Grapes: The wine grape is transformed into an exported industrial product, wine, an alcoholic beverage with a specific and highly-complex role in the food sector.

---

[9]*Study of the Moroccan Wine Subsector and Recommendations for Project Activities,* MAPP- 5, Claude Falgon and Patrick Henri, February, 1994.

The interaction between these two market segments is minor and limited to the occasional use of table grapes for wine making purposes. This use is only significant during years when wine-grape production is insufficient, except in the Doukkala region.

2. Table grape production

The main regions of table grape production are Doukkala, Meknes, Benslimane, Haouz and Rabat-Sale. In total, these regions contain 73% of Morocco's table grape acreage (Table 14).

Table 16. Area (Ha) covered by table grape production by region.

REGION	ACREAGE (Ha)	PERCENTAGE %
Doukkala	13,670	37
Meknes	3,800	10
Benslimane	3,500	9
Haouz	3,450	9
Rabat-Sale	2,850	8

Table 17 illustrates the increase in acreage in Morocco's table grape industry over the past five years.

Table 17: Changes in Moroccan table grape production over the last five years.

YEAR	ACREAGE (Ha)	PRODUCTION (T)
1988/89	34,200	1,917
1989/90	36,600	1,570
1990/91		1,850
1991/92	36,700	2,130
1992/93	37,000	1,710

3. Varieties

The main table grape varieties grown commercially in Morocco are summarized in Table 18.

Table 18. Primary table grape varieties grown in Morocco.

VARIETY	ACREAGE (Ha)	PERCENTAGE
Doukkali	16,670	45
Valency	4,460	12
Muscat d'Alexandrie	3,070	8
Abbou	2,330	6
Muscat Italia	1,970	5
Alphonse Lavallee	930	3
Laadari	690	2
Cardinal	560	1.5
Madeleine	420	1

Other varieties cultivated on limited acreage include: Perlette, Sultanine, Dattier de Beyrouth, King's Ruby or Ruby Seedless, Flame Seedless, Early Superior, and Superior Seedless.

4. Season of production and Yield

The vast majority of table-grape growing regions are planted in varieties with a season which ranges from July 15 to September 10. The early or semi-early varieties (before July 15) only account for 3% of total plantings. Late-maturing varieties are virtually nonexistent.

Table grape production for 1992/93 is estimated to be 1,706 T, while that of the previous season was about 2,130 T. The difference is largely due to drought. While the national average yield went from 62 T/ha to 48 T/ha, in one season, yield remained the same in irrigated plantings. For the Haouz and Moulouya perimeter areas, the 91/92 yields for irrigated and nonirrigated vineyards were 165 and 120 T/ha respectively, and 170 and 130 for 1992/93. This again demonstrates the importance of irrigation in the Moroccan fruit industry.

5. Nursery production

The total number of grape plants produced in 1992/93 is estimated at 1,545,000 (table and wine) plants, of which 900,000 plants were produced by SO.DE.A.. The region of Meknes is the primary location of nursery plant production for grapes. The plants produced on private nurseries are essentially rooted cuttings, most often taken from pruning wood. The plants generated from this type of propagation are of poor quality with negative impact on yield and production quality and plant survival.

6. Costs and returns

The detailed analysis for this section is found in annex three. The summary of the findings are:

Estimated cost of establishment of one hectare of grapes:	98,000 DH
Estimated cost of production during first year:	8,000 DH
Estimated cost of production during second & third years:	9,800 DH
Estimated annual cost of production:	26,000 DH
Estimated average yields:	25 T/ha

Table 19: Return to the production of a hectare of table grapes

ITEM	COST
Cost of Production	26,000
Handling/packing/transport	4,000
Domestic Sales	100,000
Profit	**70,000**

G. MELON PRODUCTION

1. Industry overview

Melon production in Morocco is responsive to an export market driven demand. Melons are one of the fruit crops with the greatest increases in export volume over the past few years. The classic analysis of windows of opportunity when looking at the US, UK, and French markets is recommended. The potential to introduce new watermelon varieties, like Jubilee, Crimson Sweet, Hybrid seedless watermelon and new Cantaloupe varieties, will allow the melon buyer in Europe to consolidate a good base of product. In addition producers have the opportunity to enter the US and European market during the later part of the season from October to December.

The melon industry covers approximately 120 ha under green houses and tunnels and another 26,000 ha of open field production (producing over 300,000 tons). The main regions of greenhouse melon production are the Haouz, Souss-Massa and Doukkala. However, given the profitability of the crop, its production is being extended to other regions including Loukkos, Benslimane, Gharb, Moulouya, and even to Meknes. Open field production is also practiced during the summer months from the Loukkos region to Marrakech but primarily for the local consumer. Open field production is greatest in the Loukkos and Gharb regions.

2. Production and Harvesting

Varieties. The two main greenhouse varieties grown in Morocco are Galia and Dalton (a slightly netted Charentais with long shelf life). Other varieties Pancha, Alma, Pallas, Rasto, Polidor. The main open field varieties are Canary and Dalton.

Planting and harvesting. Melons are cultivated under large wood framed or tube green houses or small tunnels. In the large green houses the melon plant is allowed to climb to

heights of up to 2-3 meters and with production averaging 60 MT/ha. One area of concern that was identified is sizing the fruit to the specific market, thus allowing for greater returns. With the small tunnel, production averages 50 MT/ha. For the small tunnel and open field production, the common practice of using commercial beehives for pollination needs to be introduced and/or increased at the level of production. Drip irrigation is preferred to other methods. In the Souss-Massa area, two crops are harvested each year. For the fall production, sowing and planting is done in July and early August, and the harvest begins by the end of October. For winter production, the sowing occurs in November, with planting in the end of December and harvest beginning early to mid March.

Planting Date. Melons are cultivated under large plastic houses or small tunnels (tunnel nantais). In the Souss-Massa area, two crops are harvested each year. A fall production scheme, where sowing and planting is done in early August, and the harvest begins by the end of October. For winter production, the sowing occurs in November, with planting in the end of December and harvest beginning early to mid March.

To guarantee a melon with no scars, which often result from contact with the plastic and the exchange of perspiration that normally occurs in the tunnel, a coat of limestone on the plastic reduces reflection of the sun during the summer months.

Harvest and packing

Harvested melons are brought to the packing house where they are first washed with tap water and then air dried. Afterward they are manually sized and packed in cardboard boxes at 4 to 10 melons per box. The predominant sizes are 6 to 7. The average desired size for melons is 800 g to 1 kg, or 5 to 7 fruits per box. Melons are then put in a cold room at about 8C then shipped.

The charentais melon cannot be shipped well by truck and has to be shipped by air. However, Galia melons are shipped by truck without any problem. The main countries to which melons are exported are England, Germany, Italy, Benelux.

For the melons industry it is imperative that post harvest methods change. The field temperature should be brought down by using receiving water tanks. After calibration and packing occurs precooling by forcing cold air, should follow.

3. Costs and returns

The detailed analysis for this section can be found in annex 3.

The estimated establishment costs for a hectare of melons

- under greenhouse: 90,000 dh
- under tunnel: 65,000 dh

the estimated costs of productions: 227,500 dh
Estimated Yields: 60 T/ha, of which 35 for export

Table 20: Return on Greenhouse Melon Production

ITEM	COST
Cost of Production	65,000
Handling/packing/ transport domestic	15,000
Handling/packing/ transport export	87,500
Domestic Sales Export Sales	52,500 250,000
Profit	**135,000**

H. FRAISE DES BOIS: A SUCCESSFUL NICHE MARKET FOR MOROCCAN EXPORT PRODUCERS

The wood strawberry, *Fraise des bois* (*Fragaria vesca semperflorens* [alpine strawberry]), is the most widely distributed of all of the world's strawberry species. Cultivated commercially and consumed in Europe, the fruit are small, soft, and highly aromatic. In 1994, unmet demand in Europe for this fruit was 700 tons. Several Moroccan exporters are trying to meet this demand and have not.

One exporter who specializes in this crop hopes to meet half of this demand in Europe next year. They have expanded production from 7 ha in 1993 to 21 ha in 1994 to 50 ha in 1995. They are growing the variety 'Queen of the Valley' on raised beds in the same cultural management system used for strawberry culture in the rest of Morocco. Plants were obtained from France and from a high elevation nursery in Morocco. Production starts in the last week of February through August and comes in approximately six week cycles. Plants are fruited for two years with yields of 7 tons per hectare in the first season and 4-5 tons in the second year.

Prices are over $7.00 US per kilogram for fresh fruit. Of what is packed, 20% goes into the highest grade and is frozen in baskets. Another 60% goes in 5 kilogram IQF boxes for $4.40 US per kilo. The remaining 20% is block frozen for processing at $3.00 US per kilo. The fresh and frozen product is of good quality.

This has been a profitable market. Costs of production are the same as for other strawberry production in Morocco except for slightly higher harvest expenses as pickers can only pick about 600 grams per hour of this small and delicate fruit. This is an excellent of a producer who reacted quickly to a market demand and has done well. Unless demand in Europe for non-European imports increases, it is likely that as other growers grow this crop that prices will lower within several years. However, as a small part of a diversified export program, *fraise des bois* has continued potential.

I. POTENTIAL FOR PRODUCTION OF CANEBERRIES AND OTHER SMALL FRUIT CROPS - CANEBERRIES, BLUEBERRIES, AND BUSH FRUITS

Over the years, a number of other small fruit crops have been grown for trial or limited production. The most promising of this group are caneberry crops, of which there is significant interest among Moroccan fruit growers.

1. Caneberries

Raspberries and blackberries are different than many other fruit crops and require a different type of cultural management. They are biennial in growth habit, are subject to a number of serious disease problems and the fruit are very perishable. Small scale production of caneberries as well as a number of small variety trials have been attempted in Morocco and some of these are ongoing and of significant interest to a number of fruit producers. It is not known the actual surface area planted to caneberries at present, but with new trials being planned by some producers, caneberry crops could become another potential export crop which will serve to add to the diversity of a producer's product line.

Current Experience with Caneberries

While a number of fruit and vegetable crops are relatively easy for an experienced grower to move into in Morocco, caneberries are not among the easiest. This has been the case for a number of producers who have not continued with caneberries after small trials. The primary reasons given were that they are too difficult to grow, the fruit are perishable, the export market is already full and a local market does not exist. The past and current experiences of several producers are summarized as follows:

1. One grower had 0.5 ha trials of both a red raspberry variety and 'Hull' thornless blackberry ten years ago. Production was at higher elevation near Oulmes. He felt that his raspberries could yield the equivalent of 40 T\ha and the blackberries more than that. He did not continue with caneberries due to an underdeveloped local market which was flooded just with his own production.

2. Another producer who has experimented with raspberries is growing 'Heritage' and 'Schoeneman' at high elevation. While he sees some potential in the crop, he feels that his experience at lower elevation demonstrates the need for altitude and cold. Yields were acceptable at lower altitude but pest problems were worse. He complained of a disease problem which caused cane death in June and resembled symptoms of *Verticillium* or *Phytophthora*. Other pest problems included spider mites, thrips and mildew. Plants were purchased in France for approximately $0.50 US per plant. Birds are also a considerable problem and he is considering netting for his small planting.

3. A current trial at low elevation was observed in Kenitra. They are trying three varieties of caneberries including 'Heritage', boysenberry, 'Dirksen', 'Thornfree' as well as tayberry. In its second year, 5 ha of 'Heritage' red raspberry was just starting to be harvested in mid-June. The fruit were of acceptable quality and size, but yields were low as the summer crop (it is a fallbearing cultivar) was borne on plants that were barely

1 m in height, making the 2 m trellis wire unnecessary. Plants are spaced 1 m apart and are drip irrigated and fertigated. Mites are a problem and weevils were chemically controlled. The blackberries were grown at spacings of 2 m within the row and 3 m between rows. Frozen product of boysenberry and red raspberry were sampled and while the boysenberries were very tart, the berry size, integrity and appearance were good. The potential for a quality IQF caneberry product is high.

4. A new variety trial and nursery project has been started south of Casablanca in Azemmour. Varieties being trialed include: 'Heritage', 'Summit', 'Autumn Bliss', 'Amity', 'Ruby', 'Willamette', an unknown California genotype as well as what appeared to be the British Columbian variety 'Comox' or 'Chilcotin'. This producer found fertigation regime to a critical factor. Since few if any chilling hours would be satisfied for raspberries at this location, the management plan is to plant in January, crop in June, crop in September and then dig root material for two months of cold storage prior to planting again in January. Given the unusual cultural strategy and high pH (8.3 adjusted to 7.8) of the soil, the plants were vigorous and fairly productive. Fruit size and quality were surprisingly good. Many growers are interested in this planting and thus it will be expanded next season in order to expand nursery production potential.

Market potential.

The export potential of caneberries is a mixed picture. There are currently some narrow early and late windows of opportunity left in the European market for fresh caneberries. Competition from France, Poland and Chile is very high and production within Europe is considerable.

Fresh market. Fresh caneberry prices on the 1994 European market were good. Early in the season, during the third week of March, Chilean raspberries received 90 French francs\kg while Spanish fruit received 110 francs\kg. Later in the season, Spanish raspberries were priced at 60-80 French francs and French raspberries at 80-90 francs\kg during the second week of May. During the first week of May, fruit can sell for 100-110 francs\kg. After northern France finishes harvest, Polish production comes on line with the rest of the world's summer crop, and prices fall. One opportunity with blackberries may be in February, when Chilean fruit was alone on the market this year in the middle of the month and sold for 110-120 francs\kg.

Processing market. While the frozen red raspberry market is currently somewhat favorable, it is certain that this market will become less profitable again within several years. Reasons for this include reduced future processing demand due to high prices in 1993-94, industry expansion in the Pacific Northwest of the United States and elsewhere, and the eventual return of Bosnia, the world's former leading producer, back into the world market. While caneberries would make a good choice for some producers as part of a diversified product line, it would be unwise to build an industry around current production windows for world fresh fruit production, and certainly not with strong reliance on the world processing market. In addition, neither should be attempted without some development of a local market for these products within Morocco.

Potential for Caneberry Crop development in Morocco.

Trials of a wide range of varieties should continue at both low and high elevations. Due to a general lack of information for questions of environmental biology in *Rubus*, it is unknown as to what the potential for harvest date manipulation is by genetic and cultural means. It is likely that the summer and fall crops could both be broadened into periods of higher demand. At low elevations, red raspberry cultivars adapted to the southeastern United States should also be tried, and, in general, it is imperative that more cultivars from British Columbia be planted in a range of locations for fresh fruit trials. These cultivars produce large, beautiful fruit and have been slow to be adopted in the Pacific Northwest of the United States as the market there is 95-98% for processed fruit. In addition, a range of blackberries should be planted in trial, with varieties adapted to the southern United States (Arkansas varieties) being of particular interest.

2. Potential for Other Small Fruits in Morocco

A wide range of other small fruits are possible and some are being tried currently.

Blueberries observed at low elevation were doing very poorly, likely due to the combination of high pH (blueberries are acid-loving), low chilling, low soil organic matter and warm temperatures. There are areas of high elevation (Oulmes) that have upland soils with lower pH and high organic matter which could support highbush blueberries. It is possible that some of the low-chill southern highbush (Florida) and rabbiteye blueberry cultivars adapted to the southeastern United States could perform acceptably in the coastal piedmonts.

Bush Fruits such as currants and gooseberries also have enough limited potential to plant small trials, particularly at higher elevations. A low elevation, a coastal planting of bush fruits was not performing acceptably. Potential markets are unclear and require further study prior to any serious trials of these crops with limited markets.

IV. EXPORT MARKETS FOR MOROCCAN FRUIT PRODUCTS.

A. OVERVIEW OF MOROCCAN EXPORTS

Moroccan exports of fresh fruits other than citrus have traditionally been quite limited. The table below provides the statistics for these exports over the last three years, revealing that two products have recently begun to rapidly expand.

Table 21: Moroccan Fresh Fruit Exports 1991-1994

PRODUCT	1991/92	1992/93	1993/94
MELONS	2,635	5,165	7,785
STRAWBERRIES	995	5,152	6,967
PEACHES	339	729	835
APRICOTS	143	402	165
NECTARINES	24	253	300
CHERRIES	4	-	-
FIGS	13	2	-
TOTAL	4,153	11,677	16,061

Source: EACCE

Clearly melons and strawberries have dominated the exports, both focusing on the early season market. Their increase has been extremely rapid, reflecting the dynamic nature of the large fresh fruit exporters[10] who have been responsible for the melon exports. The majority of the fresh strawberry exports have originated from the North, between Larache and Kenitra, driven by Spanish investors.

B. MAJOR POTENTIAL MARKETS FOR MOROCCAN PRODUCT

The potential markets for Moroccan products are qualified primarily by purchasing power and affordable access (transport) within the conditions specified by the crops. Given the quantities of export which the Moroccans can usually develop, viable long term market opportunities must be able to consume large quantities of the products. Transport is and will

[10]see the Early Fresh Vegetable Subsector Study, January 1994, for more discussion of this subject.

be a major limiting factor in expanding Moroccan export of fresh product. The highly perishable nature of most fresh fruits means that rapid delivery and maintaining the cold chain are imperative. These two factors combine to make the European Countries the **principal** target markets for the products covered in this study.

This section will review the principal European markets for each of the products,

Table 22: EUROPEAN UNION IMPORTS OF THE SEVEN FRUITS IN 1992
(in tons)

	STRAWBERRY	PEACHES	MELONS	RASPBERRY	GRAPES	APRICOTS	CHERRIES
WORLD	209,407	607,352	273,075	14,021	880,516	84,148	106,292
INTRA EC	185,361	590,511	194,207	3,256	686,395	79,249	53,431
EXTRA EC	24,046	16,841	78,871	10,765	194,121	4,899	52,861

Source: Eurostat

1. Strawberries

European imports of strawberries dropped in 1992 and 1993, reflecting the recession in Europe.

Table 23: European Union strawberry imports(tons)

	1990	1991	1992	1993 (October)
Intra U.E	171,161	190,621	185,362	165,176
Extra U.E	24,589	37,343	24,076	22,314
Imports, Total	195,750	227,964	209,438	187,490

a. Suppliers.

As is clear from the table above, the E.U. supplies most of the strawberries it consumes. Spain remains the major supplier of strawberries from within the E.U., accounting for nearly 50% of total imports, followed by Italy. From outside the EC, Poland has been an important supplier, followed by Israel and now Morocco.

b. Consumers

Germany is the major importing country for strawberries in the E.U. accounting for nearly half of total imports, on average. Spain and Italy are its major suppliers.

France receives about 50,000, getting 90 % from Spain. The United Kingdom is third on the list with 20,000 tons followed by Holland. Both of these countries are supplied from numerous sources.

c. Major Opportunities

Strawberries are Morocco's most rapidly increasing fresh fruit export, as noted in chapter 2. There are still many opportunities for Morocco to continue to increase its exports.

Table 24: Optimal Strawberry Exports (in FF/kg)

STRAWBERRY	JAN.	MAR	APRIL	MAY
FRANCE	24,00	18,00	11,00	
RFA	24,00	18,50	12,50	
U.K.	24,00	18,00	12,50	9,50

While Moroccan exporters are getting their first production in January, there is a very strong market for the product even earlier if they can have sufficient production to fill up a truck. According to the Eurostat figures, Moroccan exports in January were only 64 tons in 1993, barely four truck loads.

The French and German markets are the strongest potential ones, and they prefer the Chandler and Osso Grande varieties.

2. Peaches and Nectarines

This is a very large category, but with only limited imports from outside the EU.

Table 25: European Union Peach Imports (tons)

	1990	1991	1992	1993 (October)
Intra U.E	560,062	537,773	590,558	329,372
Extra U.E	11,386	14,137	16,837	7,084
Imports, Total	571,448	551,910	607,395	336,456

a. Consumers

Germany is the largest consumer of Peaches in the E.U., with about 340,000 tons in 1992 (56% of total EU imports), compared to the United Kingdom's 98,000 tons (16%) and France's 53,000 tons (9 %).

Consumption is highest during May and early June when the production is present. Early (April and earlier) and late (Late June) varieties will capture the highest prices.

b. Suppliers

The main suppliers of peaches and nectarines to the E.U. are its member states, Spain Italy, and Greece. Their production comes on line beginning in April, but the major exports start in May. Italy is the dominant supplier to Germany and the U.K., while Spain captures 75 % of the French import market. Greece is the second largest supplier to the E.U. with most of it going to Germany.

From outside the E.U., Chili is the dominant exporter during the peak price months of January - April, but we see in the chart in annex nine, that South Africa also captures very high peach prices during January - February (2-3.2 ecu/kg= 15-22 ff/kg).

Morocco's exports have been minimal, but are gradually increasing to Europe. Their exports have only been on the market in April and May at about 10 ff/kg. Moroccan exports appear on the Hamburg wholesale market statistics (see chart below) in the first week of May, selling for the equivalent of 2.2 ecu/kg (15 ff/kg)

Nectarine prices behave comparably to peach prices. The chart in annex 12 shows that Chile dominates the German wholesale market in the early months, December until April with prices mostly in the 2-2.7 ecu/kg range, but way up at nearly 4 ecu/kg during the holiday season in December. But the early Spanich nectarines, which reached the German market at the end of May, captured the highest regular season price, just over 3 ecu/kg.

c. Major Opportunities for Morocco:

Morocco produces a quality product, but needs to arrive on the market as early as possible, preferably before the month of May. The following countries and months are the most propitious markets for Moroccan peaches.

Table 26: Optimal Peach Exporting Periods and Markets
(in FF/kg)

PEACHES	APRIL	MAY	JUNE
FRANCE	10,00	10,00	11,50
GERMANY		10,00	7-10,00
U.K.		10,00	11,00

source: Eurostat

It is clear that France and the U.K. are the two best markets in terms of average prices. The varieties Spring Crest and May Crest are the two most popularly consumed varieties across Europe.

Saudi Arabia and the Gulf States are a viable market for Moroccan exports since Morocco is producing after this region's main supplier, the Middle East, stops.

3. Melons

Over 75 percent of all melons which are traded in the E.U. come from within the Union. Imports have increased marginally over the past four years.

Table 27: European Union imports of melons (tons)

	1990	1991	1992	1993 (October)
Intra U.E	187,350	227,936	194,380	204,879
Extra U.E	49,533	67,644	78,931	66,064
Imports, Total	236,883	295,580	273,311	270,943

a. Consumers

The major melon importing country in the E.U. is the United Kingdom, with 99,000 tons in 1992, followed by Germany and Holland with about 46,000 and France with 31,000 tons. Despite France's smaller consumption, it pays 50 % more per kg for the melons it consumes than the other major consumers.

Imports are at their highest from May through September, the months when Spain is at its peak. Prices remain good in May, but then drop well below 1 ECU/kg in June-Sept. Prices paid are highest from February - April (See chart in annex 12).

b. Suppliers

Brazil is the earliest supplier on the market, present from January through April . In April, however, they begin to get competition from Spain and Israel. Brazil's prices are never very high, due to their overall lower quality, and the European production captures much higher prices when it comes on lin in April.

Moroccan production arrives in the markets in April also, capturing prices equivalent to the European exporters.

Spain is the largest overall supplier, with 133,000 tons in 1992, accounting for 50% of U.K. imports and 80 % of French imports.

c. Opportunities

There are tremendous opportunites for melons from Morocco. It has already increased more rapidly than any other product in recent years. From a perspective of price/country, the following table presents the major opportunities.

Table 28: Optimal Markets and Periods for Melon Exports (in FF/kg)

MELON	MARS	AVRIL	MAI
FRANCE	9,00	11,00	8,00 - 9,50
RFA	8,00	11,00	8,50
ROY. UNI	7,00	10,00	9,00

While the U.K. pays the lowest overall prices, they also have the greatest capacity for import, and therefore offer an important target market. Meanwhile, France offers the highest prices.

The preferred varieties are the Gallia melons for the U.K. and the Charentais melons for France.

A second important opportunity exists for melons between October and December in Europe. This is after South America has stopped producing. As controlled atmosphere transport improves, there will also be additional market opportunities in the U.S. and Canada during these months.

4. Apricots

While Morocco is an important producer of Apricots for processing, it exports very few fresh apricots. Meanwhile, E.U. consumption of Apricots has been increasing steadily

Table 29: Euuropean Union imports of apricots

	1990	1991	1992	1993 (October)
Intra U.E	51,780	68,424	79,255	63,647
Extra U.E	5,207	4,845	4,908	2,472
Imports, Total	56,987	73,269	84,163	66,119

a. Consumers

Apricots are only on the market for five months a year. Germany imported about 50 % of the E.U.'s total 85,000 in 1992 (43,000 tons). France imports from Spain at the beginning of the season, before it becomes an important supplier in July and August. Italy is also an important importer.

b. Suppliers

South Africa is the major supplier during the early months of the year (December - February), capturing good prices (2-3 ecu/kg according to Eurostat, but only 1.5-2 according to Hamburg wholesale market figures). Spain then follows with major supplies in May and June. France was the largest overall supplier in 1992, reaching 40% of total supply, with exports over a long period due to good varietal diversity. Greece and Italy arrive on the market at about the same time as France (June) but peter out by July, while France maintains a strong presence into August and September with prices hovering about 1 ecu/kg. Due to proximity considerations, Greece is an important supplier of the German Market.

c. Opportunities

Even though there are imports during the first five months of the year, Morocco only comes on line in May. The main markets with the best prices which fit Morocco's production schedule are presented in the table below with prices in French Francs:

Table 30: Optimal Periods and Markets for Apricot Exports (in FF/kg)

APRICOT	APRIL	MAY	JUNE
FRANCE		10,00	11,00
GERMANY		10,00	9,00
U.K.		12,00	9,00

In May and June, France is the best target market in terms of price. Germany pays less, but absorbs important quantities. There is an important opportunity for increasing the value added to apricots through good marketing techniques.

The preferred varieties on the French market are the Orangered, Bebeco, and Jumbo Cot.

5. Grapes

While Morocco exports virtually no grapes, there is an important market for them in the E.U. In fact, with 39 % of imports coming from extra-EU markets, this is a very large potential market for exporting countries outside of the E.U.

Table 31: European Union imports of grapes (tons)

	1990	1991	1992	1993 (October)
Intra U.E	583,000	668,121	700,897	261,581
Extra U.E	160,197	171,806	195,690	222,502
Imports, Total	743,197	839,927	896,587	484,083

a. Suppliers

Italy is the dominant supplier from within the E.U. accounting for over 45 % of all imports, including 65 % of French imports and 55 % of German imports.

The Chart in Annex 12 presents the timing and pricing of the Chilean exports to Covent Garden and Hamburg, as well as the South African exports to Hamburg and the Greek exports to Covent garden. What stands out in this figure is that the South African grapes command prices which are 25% higher than the Chilean grapes in the Hamburg Market. Greece also stands out as the end of season supplier to Covent Garden, with prices doubling as the holiday season approaches.

In terms of timing, Spain remains an important competitor for Morocco, with its main production arriving in July. Greek production parallels the Italian production and is exported primarily to Germany.

Chile is the principal extra - E.U. supplier, capturing much of the early market, along with some production from South Africa for the early saeson. Holland accounts for a large amount of the off-season supply, primarily re-exported Chilean product

b. Consumers

The dominant consumer of imported product is Germany with about 400,000 tons in 1992, followed by France with 157,000 tons, and 130,000 tons for the U.K. While the German and French markets are dominated by Italian product, the U.K. imports from a variety of suppliers - Greece, Holland, Spain, and Italy.

c. Major Opportunities

Realistic export opportunities exist for the month of July under current growing conditions, though there are producers with varieties which can come on the market in June.

Table 32: Optimal Periods and Markets For Grape Exports (in FF/kg)

GRAPES	JULY
FRANCE	6,50
GERMANY	6,50
U.K.	7,50

The U.K. offers the highest prices for product, largely because of the specifity of their orders for the large supermarkets.

6. Cherries

Cherries are an important product for export to the E.U. since extra-E.U. imports account for nearly 50 % of total imports in fairly large quantities.

Table 33: European union imports of cherries (tons)

	1990	1991	1992	1993 (October)
Intra U.E	40,311	38,010	48,670	31,104
Extra U.E	24,937	54,403	46,103	27,092
Imports, Total	65,248	92,413	94,773	58,196

a. Suppliers

Hungary was the no. 1 supplier of cherries to the E.U. market with 23,000 tons in 1992, coming primarily during June and July. France, habitually the leading supplier, was second with nearly 11,000 tons in 1992, beginning mainly in May. Italy is the second major E.U. supplier coming on the market in June (9,000 tons total export), along with Greece (7,300 tons total export).

The extra E.U. suppliers are habitually led by Poland (7,000 tons in 1992, 1993, and 10,000 tons 1991) and Hungary (18,000 tons in 1991, 23,000 tons in 1992, 6,000 tons in 1993).

France dominates the early season, with about 50 % of the May imports.

Cherries are the only fruit where the U.S. maintains a presence in the E.U., exporting about 3,500 tons (3.5 % of total traded cherries). The exports are greatest in July, with some encroachment on June and May, and some spillover into August.

b. Consumers

Germany is the number one consumer of imported cherries (49,000 tons in 1992), followed by Holland (23,000 tons), Belgium (10,000 tons) and the U.K (9,000 tons).

c. Major opportunities

The internal Moroccan market will probably remain the best over all market for Moroccan product, however, the best times of year to export are April (if one can get production) and May, which are the months preceding the major E.U. production.

Table 34: Optimal Periods and Markets for Cherry Exports (in FF/kg)

CHERRIES	MAY	JUNE	JULY
FRANCE	10,00	6,00	5,00
GERMANY	10,00	13,00	8,00
U.K.	8,50	9-11,00	

Morocco does not traditionally export many cherries, but there are interesting opportunities if it can get its production up and if it can get on the market early. It will always face important competition from the E.U. producers.

The preferred variety is the Tragana.

7. Raspberries

Raspberries are imported in relatively small quantities, but they are a very high value crop making them extremely interesting to Moroccan exporters.

Table 35: European union imports of raspberries (tons)

	1990	1991	1992	1993 (October)
Intra U.E	2,497	2,555	3,256	2,325
Extra U.E	9,928	9,401	8,306	14,118
Imports, Total	12,425	11,956	11,562	16,443

a. Suppliers

Traditionally the main supplier of raspberries has been Eastern European countries: Poland

(dominant), Hungary, and Roumania. However, there has been a recent drop off from Hungary and Roumania. Despite their dominant position in terms of supply, the Poles consistently capture the weakest prices.

Within the E.U., the main supplier has been Germany (most likely re-exported Polish product) and Holland. Chile is on the market from December through May, capturing average import prices from 10-15 ECU/kg (60-90 FF), with product wholeselling at 15-25 ecu/kg.

The U.S. is a late season supplier of about 150 tons/year (mostly in October), but continues to be on the market through November when it captures its highest prices (reaching 20 ecu/kg in the Hamburg wholesale market).

As the figure in annex 12 shows, the U.K supplies some raspberries to its own market, but the quality is poor so they capture a very low price.

b. Consumers

July is the peak month for consumption (when the Polish exports are greatest), though there is supply the year round.

c. Major Opportunities

There are important opportunities for earning money with fresh raspberry exports as is evident in the table below. The best markets are clearly France and the U.K. The German market imports lots of cheap product from Poland, bringing down their overall price, but they pay much higher prices for higher quality product. The competition from the Eastern European countries is stiff, however, and they will consistently try to undercut our prices.

Table 36: Optimal Periods and Markets for Raspberry Exports (in FF/kg)

RASPBERRY	JAN.	FEB.	MAR	APRIL
FRANCE	70,00	49,00	59,00	
RFA	20,00	29,00	28,00	64,00
U. K.	65,00	57,00	54,00	

C. QUALITATIVE CRITERIA PER MARKET

The table on the following page summarizes the qualitative elements surrounding packaging, coloration, size and shape of fresh fruit imports into the EU. These qualitative elements need to be respected if Moroccans are going to capture any sizeable portion of the market.This table includes: the origin; country; variety, aspect; packaging and packing for the various products.

TABLE 37: QUALITATIVE CRITERIA DEPENDING ON MARKETS

COUNTRY	PRODUCT	ASPECT		COLOR	SIZING	PACKING	ACCESS	T. PACKAGING	WEIGHT. PACKET	NB.C
		VARIETIES	SHAPE							
FRANCE	PEACHES	SILVERY	ROUND	RED	AA/A/B	LITE	ALV/STI	WOOD	4	160
FGR	PEACHES	SP. CREST	ROUND	RED	AA/A/B	LITE	ALV/STI	WOOD	4	160
HOLLAND	PEACHES	MAY.CREST	ROUND	RED	AA/A/B	LITE	ALV/STI	WOOD/CAR	5	160/2
UK	PEACHES	ELSANTA	ROUND	RED	AA/A/BC	LITE	ALV/STI	WOOD/CAR	56F	70
FRANCE	APRICOTS	O'RANGERED	OBLONG	ORANGE	40/45	LITE/BULK	ALV/STI	WOOD	6 a 7	88/15
FRG	APRICOTS	BEBECO	OBLONG	ORANGE	50/55	BULK		WOOD	5	200/2
HOLLAND	APRICOTS	BEBECO	OBLONG	ORANGE	50/55	BULK		WOOD	5	200/2
UK	APRICOTS	JUMBO COT	OBLONG	ORANGE	45/50	BULK		WOOD	5	200/2
FRANCE	STRAWBERRIES	CHANDLER	OBLONG	RED		BARQ		WOOD/CART	5	110/1
FRG	STRAWBERRIES	DOUGLAS	OBLONG	RED		BARQ/WOOD		WOOD/CATR	5	110/1
HOLLAND	STRAWBERRIES	ELSANTE	OBLONG	RED		BARQ/CART		WOOD/CART	5	110/1
UK	STRAWBERRIES	CHANDLER	OBLONG	RED		BARQ/CART		WOOD/CART	5	110/1
FRANCE	RASPBERRRIS	JONG.V.T.	ROUND	RED		BULK		WOOD	4	200
FRG	RASPBERRIES	JONG.V.T.	ROUND	RED		BULK		WOOD	4	200
HOLLAND	RAPSBERRIES	JONG.V.T.	ROUND	RED		BULK		WOOD	4	200
UK	RASPBERRIES	JONG.V.T.	ROUND	RED		BULK		WOOD	4	200
FRANCE	GRAPES	ITALIA	ROUND	N/B		BULK	ALV/PAP	CARTON	5	150/1
FRG	GRAPES	BARLINKA	ROUND	N/B		BULK	ALV/PAP	CARTON	5	150/1
HOLLAND	GRAPES	LAVALLR	ROUND	N/B		BULK	ALV/PAP	CARTON	6	150/1
UK	GRAPES	PERLETTE	ROUND	B		BULK	ALV/PAP	WOOD	5	150/1
FRANCE	MELON	CHARANT	ROUND	YELLOW	5/6/7/12	LITE/PED	ALV/STI	CART/POLYLINR	15	56/72
FRG	MELON	GALIA	ROUND	YELLOW	5/6/7/13	LITE/PED	ALV/STIC	WOOD	5	140/1
HOLLAND	MELON	GALIA	ROUND	YELLOW	5/6/7/14	LITE/PED	ALV/STIC	WOOD	5	140/1
UK	MELON	GALIA	ROUND	YELLOW	6/9	LITE	ALV/PAP	CART	5	140/1
FRANCE	CHERRY	TRAGANA	ROUND	RED	20	BULK		WOOD	4	128/1
FRG	CHERRY	TRAGANA	ROUND	RED	20	BULK		WOOD	4	128/1
HOLLAND	CHERRY	TRAGANA	ROUND	RED	20	BULK		WOOD	4	128/1
UK	CHERRY	PICO NEGRO	ROUND	RED	20	BULK	COMPLEX	WOOD	4	128/1

Code: LITE = arranged in rows; ALV = paper wrapper; STI = sticker; PED = stem, PAP = paper; BARQ = tray.

C. DISTRIBUTION CHANNELS, BY COUNTRY: BELGIUM - HOLLAND THE U.K. - GERMANY - FRANCE

1. Belgium

Most fresh fruit and vegetable importers are located in Brussels and Antwerp. The product is imported either via sea to Antwerp or by plane to Brussels. There is also an important import by truck from Paris (Rungis) or from Rotterdam, coming from the main wholesale markets.

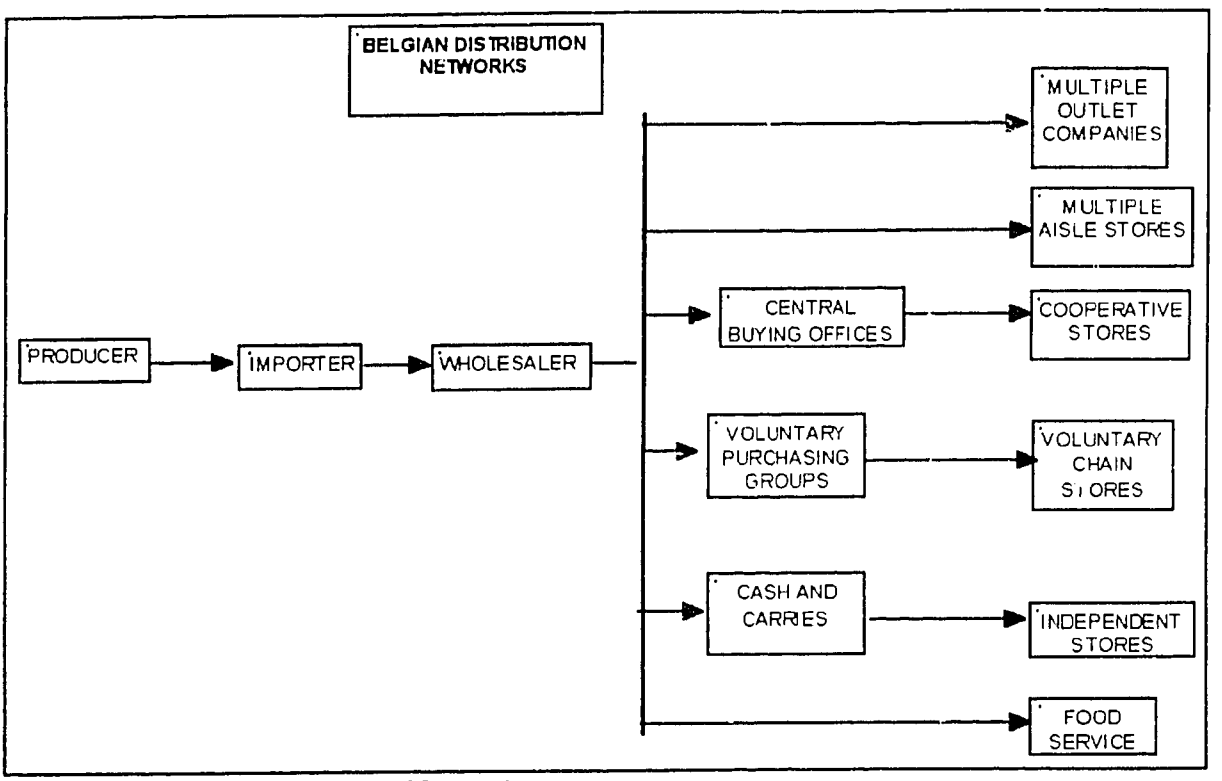


Figure 5 Belgian Distribution Networks

Most imports are bought on a commission basis, which amounts to 8-10 % of the sales price, depending on the product and its volume.

Because of the limited size of the market, very few companies handle off season imports of fresh fruits and vegetables. Those which do are based in Brussels, home of the major Belgian wholesale market.

a. Types of operators and their roles

The channel from the producer to the consumer has at the most six steps, as shown in figure no. 5:

- Wholesellers and importers
- Importer sells directly to link 4 or 5, without passing by the wholeseller;
- The grower sells directly to link 3, 4, or 5, skipping the importer/wholeseller. This is often the case going through central purchasing offices for the large chains who can negotiate direct imports given their size;
- Links 2 and 3 can split apart to the national wholeseller and a local wholeseller.

2. Holland

a. Overall environment

Dutch importers are located across the country, notably in the main auctions, or near the main wholesale markets.

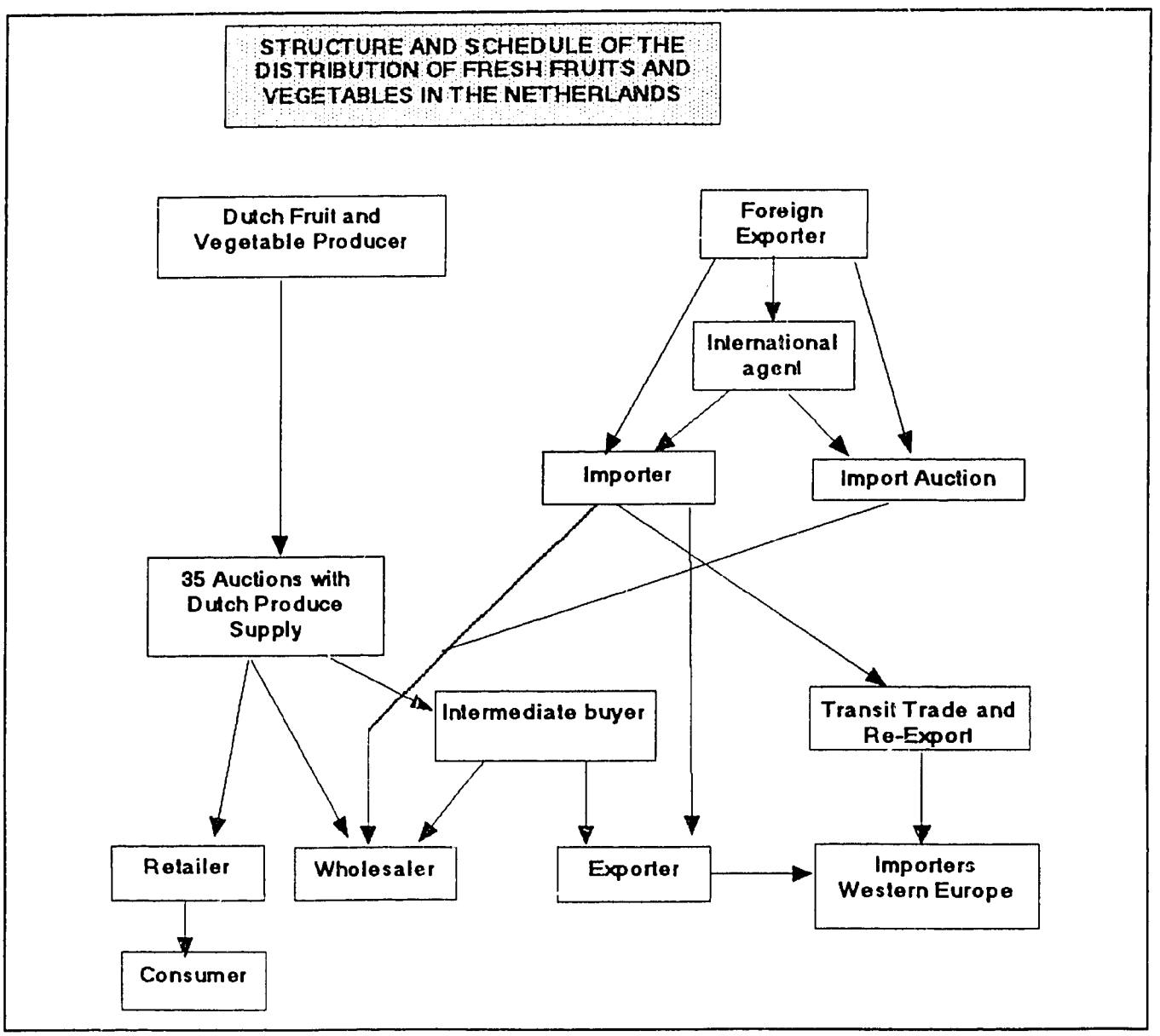


Figure 6 Dutch Distribution channels

All the same, Dutch imports of fresh fruits and vegetables are concentrated around Rotterdam due to the port activity and the auction of Barendrecht several kilometers south. Offices and warehouses are built near the port of Rotterdam, to optimize the transfer and distribution of the merchandize. Other important auction for importers are BLEISWIJK, GROETENVEILING, AND WESTLAND.

The CITRUS AUCTION is located near the fruit terminal of the port. This is the initiative of a group of importers, including the largest Dutch importer: VELLEMAN ET TAS. The auction runs twice a week, with product from the five importers. Several hundred buyers participate, including commission agents, importers, exporters, and wholesellers.

Imports of off-season products works on the overseas import schedule. The wholeseller/importer usually works on consignment and takes 8-10 % commission, depending on the product, the quantities, the quality, the frequency of shipments, and the nature of the services rendered. Off-season fruits and vegetables, often expensive, highly perishable and imported in small quantities are rarely sold at auction, which is reserved for the bulk commodities.

b. Distribution Channels

A total of 770 wholesale companies are in the fruit and vegetable trade, housed primarily in four wholesale markets: Amsterdam, Rotterdam, The Hague, and Haarlem. The wholesaler sources dutch produce at the auction or get imports from the more than 100 importers and the import auction which takes place at the Rotterdam Fruit Exchange on Mondays and Wednesdays.

A network of 35 auctions, integrated by instant electronic information, is at the service of grower associations for clearing the product. Small quantities of vegetables are bought from growers on a contract basis.

One group of importers specialize in the import and re-export of produce (which effectively become transit shipments).

3. The United Kingdom

a. The different operators.

There are two different kinds of enterprises which dominate the fresh fruit marketing in the U.K.: private British companies, and the Marketing Boards. We will focus on the private companies in our discussion below.

Percentages are expressed as a part of total fruit and vegetable imports.

The pure importers. Their only activity is to import. Roughly 32 % of all merchandise passes by them. Most are located near London, often in a wholesale market. They usually have one office relying on telephone and fax. Their contacts overseas are made directly with the growers or with exporters. These importers rarely have any capacity to cold storage and

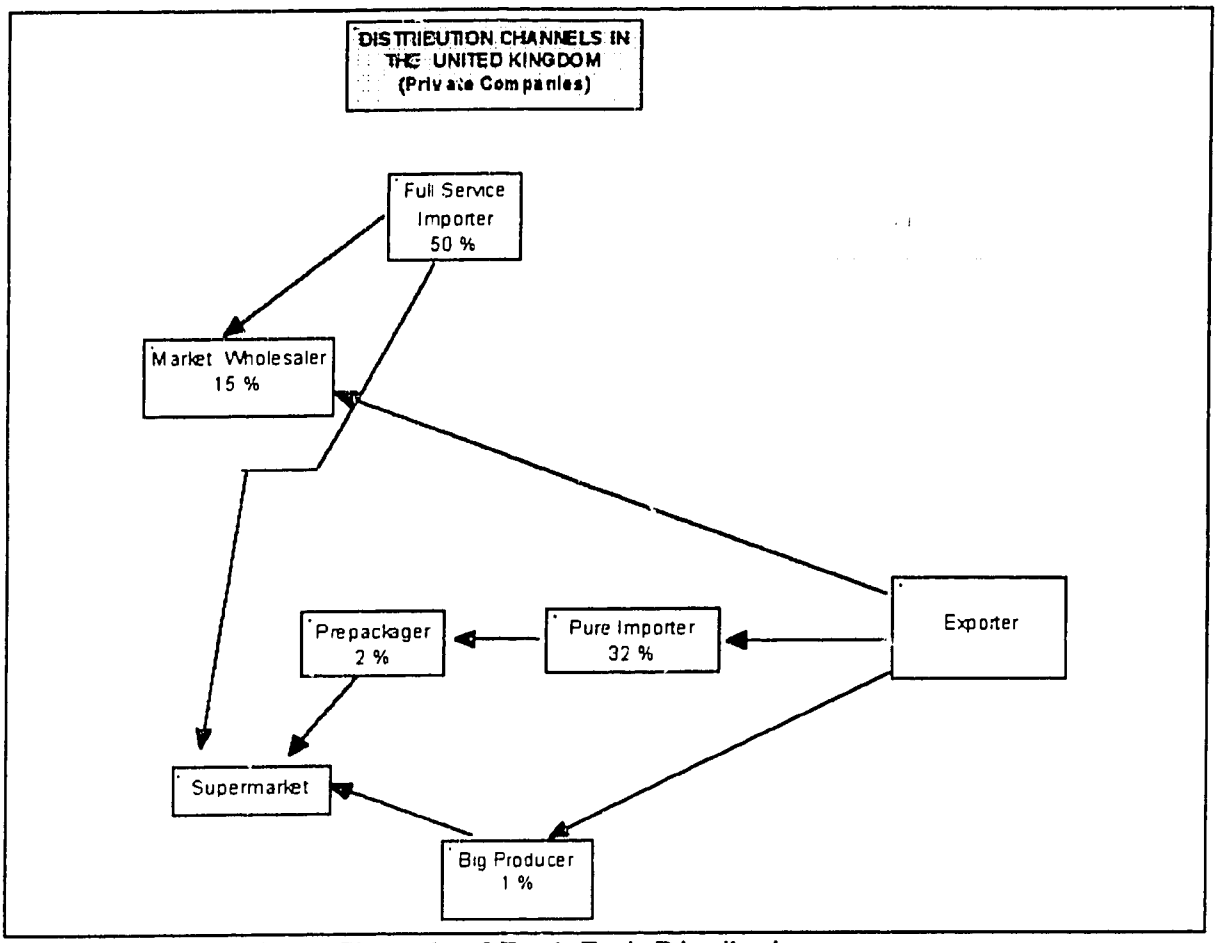


Figure 7 British Private Channels of Fresh Fruit Distribution

usually rely on subcontractors for transport. With a light and adaptable structure and few employees their operating costs are low.

These importers, depending on the importance of their company, supply the packers, 2 to 4 chains of supermarkets, and a collection of 15-20 wholesellers.

Supplying supermarkets with which they work on an established schedule leads them to create longstanding relationships with their suppliers. They often become partner like in the operations.

In the U.K., the supermarkets are especially demanding and the quality of the service which the importers must provide is often determined by the quality of the product they supply. Wholesellers are also demanding, but not as much as the supermarket chains.

Purchases by importers are usually fixed price when they are supplying the supermarkets, but the supply for wholesellers often leads them to fix the price upon arrival of the merchandise or do the accounts after sale by the wholeseller.

Wholesellers on the market. There are 38 wholesale markets and 900-1000 wholesellers. They represent about 15 % of the import activity and are divided into three categories:

- small groups without import
- small groups with imports
- subsidiaries of larger groupes

Full Service Wholesellers. These represent about 50 % of all imports. The majority of these operators tend to handle all steps in distribution. However we can distinguish:

- the large groups;
- medium sized companies;
- small independent firms

Other Wholesellers. This includes the cash and carry's (multi-product firms which are primarily food based).

The agents. At import, the agents are few and their activities limited. The most dynamic ones have become importers.

Large growers. These work independently or are grouped in cooperatives. They import in the off-season or during the regular season if they need greater quantity or quality of product for the supermarket clients.

The pre-packagers are specialized in the packaging of fruits and vegetables which they buy in bulk. These are either subsidiaries of important complete service importers or of large growers. They evolve towards the activities of a complete service wholeseller.

GERMANY

All fruits and vegetables grown or imported into Germany use the following distribution channels:

- Integrated trade or consumer cooperatives (channel one);
- Independent importers and wholesalers (channel two); and
- Associated businesses, such as retail cooperatives (channel three)

The normal distribution channels for off-season products are diagrammed in figure 8.

The importers are primarily located in Hamburg, Bremen, Cologne, Frankfurt, Stuttgart, and Munich. They receive their products on consignment and take a commission ranging from 8-10 % of the sales price, depending on the quantity and quality of the products which are handled and the frequency of shipments. The importers supply the cooperatives, companies with numerous branches and the semi-wholesalers of their city via central depots.

We estimate that 40 percent of the fruit and vegetables sold at retail pass through the associated businesses, 30 percent through the integrated businesses, and 30 percent throught the independent retailers and food service.

Most of the off season products coming by sea to Germany pass through Rotterdam, Bremerhaven or Hamburg. Products arriving by air come to Franfurt, Cologne, and Munich. Merchandise coming from Europe usually arrive by road.

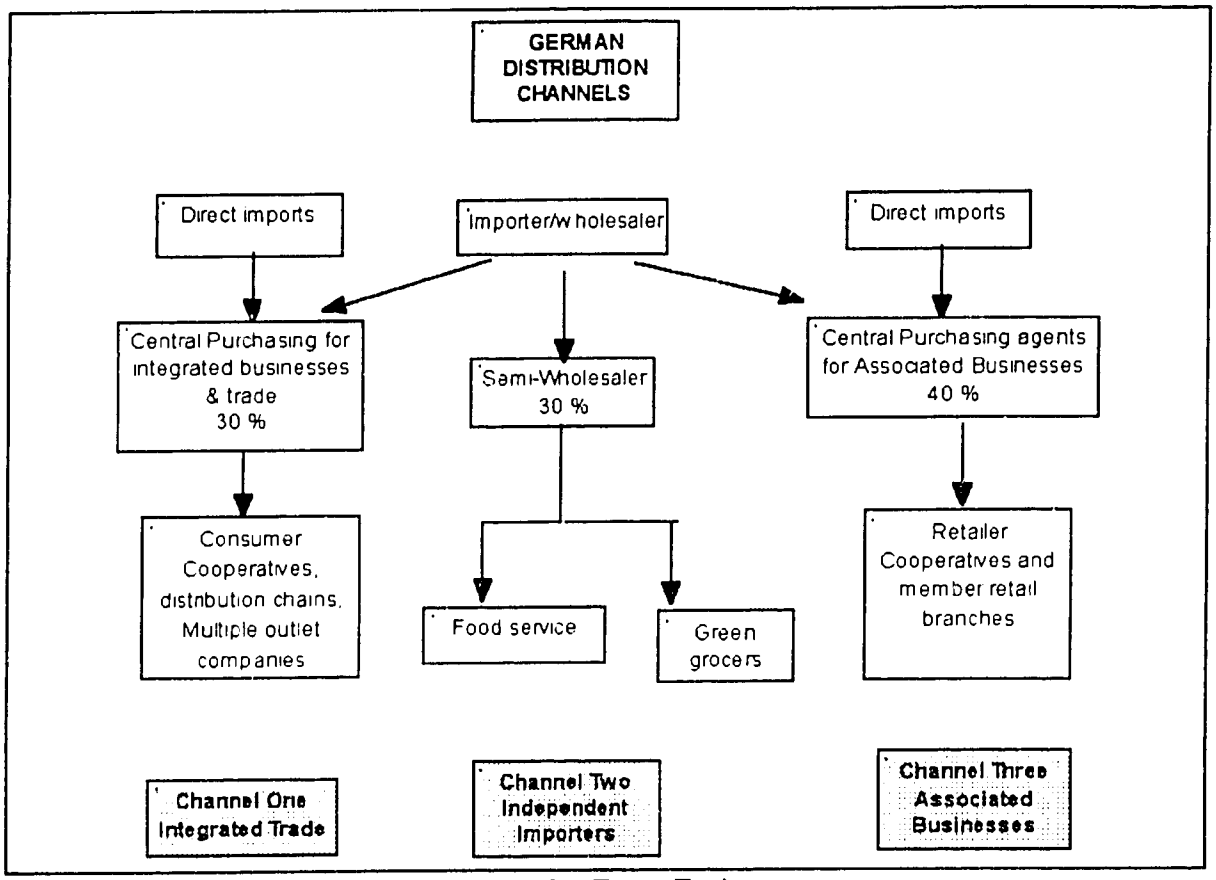


Figure 8 German Distribution Channels for Fresh Fruit

FRANCE :

The normal structure of fruit and vegetable distribution imported into France is diagrammed below. We estimate that 52 percent of the total fresh fruit and vegetable imports are sold in supermarkets or hypermarkets and continue to increase. Food service is another very important consumer of fresh produce.

In France, most importers of fruits and vegetables are also wholesalers, meaning that they supply secondary wholesalers and sell directly to supermarkets and hypermarkets. In general, the central purchasing agents for the supermarkets do not import directly.

Aside from a few large companies, the sales networks of the importer/wholesalers usually only cover the region where they are located.

It is estimated that 80-90 percent of the off season fresh fruits and vegetables which are imported into Europe are sold on commission and France exemplifies this rule. Few importers are disposed to run the risks associated with perishable products, without the

certainty that contractual relationships concerning quantity, quality, and delivery times will be respected. On the other hand, all problems with merchandise delivered to the importers clients are the importers' responsibility.

The commission also runs 8-10 percent, as in most other countries.

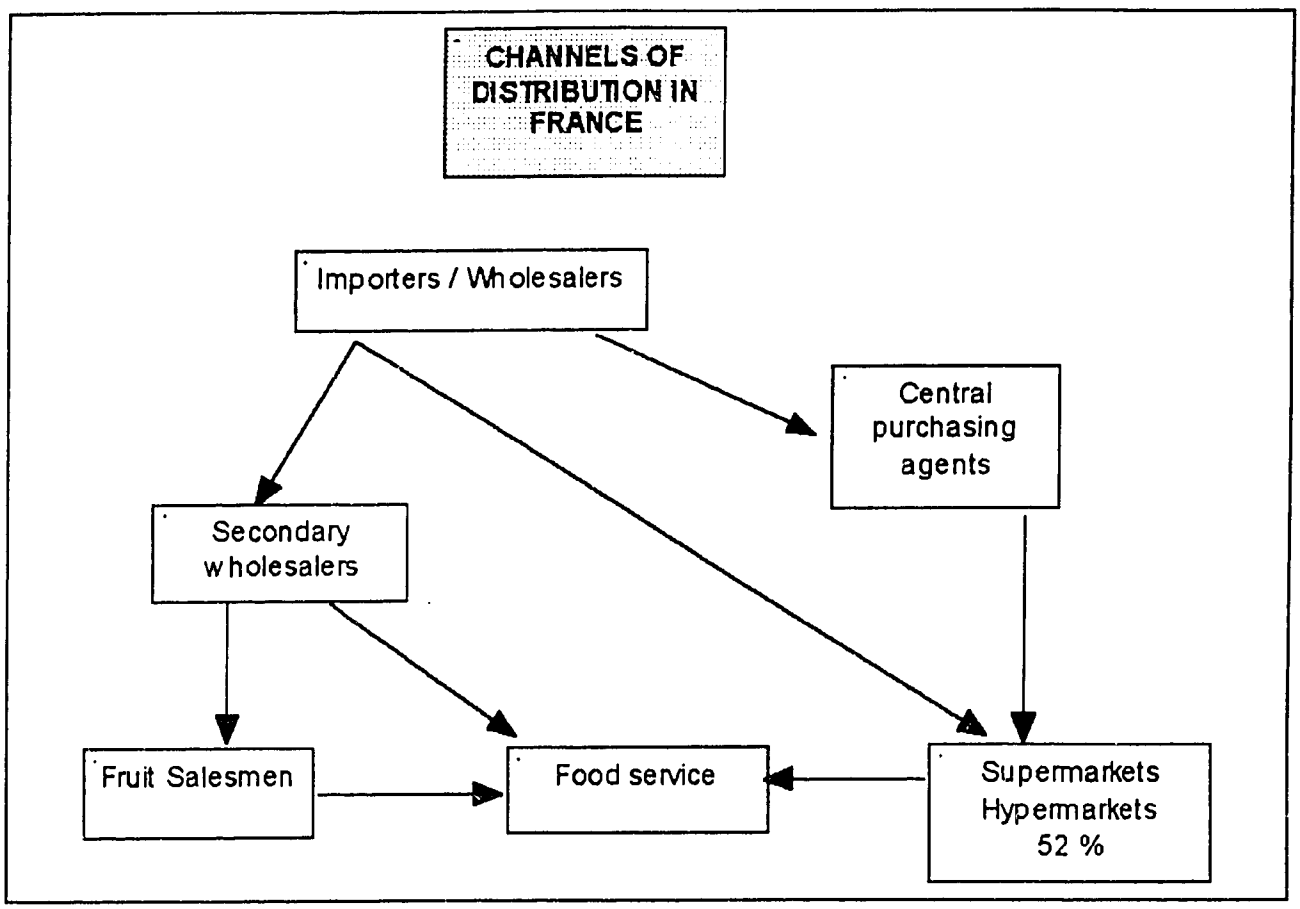


Figure 9 French Distribution Channels

E. SAUDI ARABIAN MARKET

Saudi Arabia is potentially a good market for fresh fruit exports from Morocco. It imports large quantities of products which Morocco produces and offers a good opportunity for export development. This market is fairly demanding in terms of quality, taking into account the high style of the Saudi consumers. All the same, there are also a number of emigrant workers who are less exacting in terms of quality.

Saudi Arabia has developed special relations with its neighboring countries and gives them the preferential access, even though the quality of the products and their presentation might not be as good. Its major trading partners for fresh fruits are Lebanon, Syria and Turkey, though Chile and other more distant countries are also important suppliers of specific products.

Table 38: Saudi Imports in 1991
(latest official trade statistics, one dollar = 4 rials)

PRODUCTS	QUANTITY IMPORTED (tons)	VALUE OF IMPORTS (000 of Rials)	ORIGIN AND PERIODS
Grapes	30,000		USA (Sept - Oct), Chile (Oct. - Mar), Lebanon (Jul - August), India (April - June), South Africa
Raspberries	45	411	Spain
Fresh Plums	13,000	19,172	Lebanon, Turkey, Chile, Swaziland
Melons	23,000	38,085	Lebanon, Egypt, Pakistan
Apricots	5,000	8,866	Lebanon, Turkey,
Cherries	27,000	54,167	Chile, Lebanon
Strawberries	1,000	4,903	Spain
Peaches	9,500	13,659	Lebanon, Turkey

Source: Saudi Central Department of Statistics

Moroccan exports to the Saudi Market have been quite limited to date, but in 1991 included some apricots (70 tons) and fresh plums, and more recently some grapes, strawberries, and peaches. Saudi Arabia and the Gulf States present an excellent opportunity for exporting apricots and peaches, since Moroccan production comes after the Middle Eastern production has finished.

Customs duties into the Saudi market are roughly 12 percent for most fresh products.

Given the current policy environment in Saudi Arabia which is focusing on reducing infrastructure expenditures and which will lead to reduced production of agricultural products, which will lead to an increase in imports to meet existing demand.

Acces to the Saudi Market is best achieved through the Royal Saudi Air flights which provide very interesting freight prices, on the backhaul portion of their passenger flights. A more in depth study of the market could be beneficial.

V. INSTITUTIONAL INFRASTRUCTURE IN MOROCCO RELATED TO FRUIT CROP PRODUCTION

A. RESEARCH, TEACHING, EXTENSION AND PRODUCTION

Horticultural research, and thus fruit research, teaching, and extension activities have been developed after the French model rather than that used in the United States. As a result, there are three organizations that are involved with fruit research, extension and teaching. In addition there are a few producer organizations which can interfacewith these researchers to put their findings into application.

1. The Government Institutions

The Institut Agronomique et Vétérinaire Hassan II

University-level education in horticulture is carried out by the Institut Agronomique et Vétérinaire Hassan II (I.A.V), the main campus of which is located at Rabat. The IAV Hassan II is an institutional complex of agricultural higher education, research and development which has made outstanding progress to become an institution of unique quality in the developing world. Horticultural programs are presently divided among two locations in Rabat (main campus) and Agadir, the second campus of IAV Hassan II. The Complex Horticole d'Agadir includes a department of horticulture, a department of soil sciences and a plant protection section (plant pathology, entomology, and zoology). A new department (four staff members) also exists in the Ecole Nationale d'Agriculture (E.N.A).

The IAV Hassan II is heavily involved in research, but not only within the department of Horticulutre at Rabat and Agadir, but also with other departments working with related aspects of fruit production, protection, storage, processing, shipping and marketing. In addition to the Department of Horticulture, a number of other departments (most located at the main campus in Rabat and some in Agadir) are involved in research on various subdisciplines of fruit crop production. Among these departments are faculty specializing in plant pathology, entomology and zoology, civil engineering, mechanical engineering, food science and food technology, soil sciences, and agricultural economics.

The IAV is equipped with laboratories for water, soil and plant analysis. The analyses are used to better help the growers to establish the best approaches to plant nutrition. It also has a laboratory for diagnosis of pests to help growers to prevent and effectively fight against diseases and insects.

The faculty members of the Department of Horticulture in collaboration with their colleagues from other departments have been involved in various areas of research dealing with fruit production. This research is conducted as part of their research programs or in connection with undergraduate and MS theses and PhD programs. The research programs are closely coordinated with the fruit industry in an effort to put the research institution at the service of the profession and to make a contribution to the development of this vital sector of the

Moroccan economy. Examples of the research programs in fruit production developed by I.A.V Hassan II are found in Annex 12.

The Institut National de la Recherche Agronomique (INRA)

The INRA has primary responsibility for research in a number of areas of agriculture. It has several research stations which emphasize relatively narrow horticultural objectives: Ain Taoujdate in the Meknes area (deciduous fruits); Berkane (fruit and vegetables); Marrakech (olive and date palm), Kenitra (citrus), and Agadir (vegetables). INRA research stations conduct cultivar testing and\or evaluation of local genotypes.

INRA is beginning to take a more dynamic role in directly assisting the producers. It has developed working relationships with the trade or producer organisations specializing in different crops, and even helped in their creation if they did not exist. INRA has worked very closely with the ADAME, discussed below, in fruit trials and research.

The Division de la Vulgarisation et la Réforme Agraire (DVRA)

Morocco's Extension division, the service was formerly administered by the Ministry of Agriculture, but has now become division under la Direction de l'Enseignement de la Recherche et du Developpement (DERD). The extension people are not at all involved in research activities which makes their task rather difficult. The extension service is represented at the regional level by the Directions Provinciales d'Agriculture (DPA) and the Offices Régionaux de Mise en Valeur Agricole (ORMVA) in irrigated zones.

2. The Private Institutions

There are three private institutions which are active in promoting improved practices within the subsector, as well as defending the interests of the growers: the Cooperative Arboricaole Ait Yazem (CAAY), the Association du Développement des Arbres Fruitiers de Meknes (ADAME), the Association des Producteurs Exportateurs de Fruits et Légumes (APEFEL), and the Société Agricole de Service au Maroc (SASMA). The first three are recent creations, while the third is an emanation of the Association of Citrus Producer/Exporters and the early fresh Vegetable Producer/Exporters.

Fruit growers are becoming more aware of production and marketing difficulties and constraints. They realize the complexity of the problems they face and the rapid changes in varieties, production techniques, markets and consumer demands which are shaping trends in fruit production worldwide. There is also a growing awareness of the need to associate growers and teaching and research institutions to better prepare for the future. This realization among producers is promising, however it is not at the same level among all fruit growers.

Cooperative Arboricole Ait Yazem (CAAY).

While many growers still believe that they can solve their problems and face the challenges of fruit production as individuals, growers in the Meknes area have already taken some important steps toward cooperation and organization. In 1989, a group of growers (8 large

growers) in the area of Meknes created the Cooperative Arboricole Ait Yazem" (CAAY). The objective was to purchase production inputs such as plant material, fertilizers, pesticides, irrigation supplies and equipment as a group and to create a packing house, marketing organization and processing unit in the future. The group would make common decisions for supply stocks and marketing and the cooperative would provide basic services. During the first years the co-op was faced with the problem of having to market products grown on different farms which did not necessarily follow the same cultural practices and therefore did not have the same characteristics and quality. The variation in the products made it difficult to have a common policy and to negotiate a fixed price as a group. The members of the co-op saw the need to standardize production practices in order to produce a product of uniform quality.

Association du Développement des Arbres Fruitiers de Mekne (ADAME).

This need led to the creation of another organization: the "Association du Developpement des Arbres Fruitiers de Meknes" (ADAME). According to its president, the objectives of the Association are numerous and its mandate is to help its growers to better prepare for the future. Expansion of fruit tree acreage increases each year, especially in apples, and there is a risk that prices may drop. ADAME is committed to identifying alternate fruit crops and new markets while promoting new uses of current products, developing marketing techniques and educating the consumer. ADAME will contribute to the organization of the fruit subsector by overseeing activities starting from the nursery, variety testing and evaluation, orchard management and cultural practices, plant protection, through harvesting, packing, shipping and marketing as well as processing.

Association des Producteurs Exportateurs des Fruits et Légumes (APEFEL)

APEFEL was only created in 1994. It is comprised of most of the largest Moroccan grower exporters and was created to respond to their problems, in contrast to the traditional fresh vegetable association ASPEM, which is more political and comprised largely of small growers. APEFEL has begun to organize trials for new transport methodologies, seminars in postharvest handling, and in investigating the establishment of an association nursery using the latest in nursery technology. With the most dynamic small fruit growers in the country as its members, APEFEL is rapidly becoming the most dynamic fresh fruit and vegetable association in Morocco.

ASPEM, ASPAM, and ASPRAM

The three oldest fresh produce associations in Morocco are for off-season vegetables (ASPEM), citrus products (ASPAM), and raisins/wine (ASPRAM). Of these three, ASPAM is the largest as it represents the largest Moroccan fresh export - citrus. It is quite well structured with a director in Casablanca and technical staff in Casablanca and Agadir. ASPEM, now representing primarily the small growers for fresh fruit and vegetable export, also has a solid structure, with offices in Casablanca and Agadir. ASPRAM, representing the grape producer/exporters, was founded primarily for the wine industry and interacts very little on fresh grape production.

Société Agricole de Service au Maroc (SASMA)

SASMA is the oldest one of the private groups, and is dependent on financing from two other associations (ASPEM and ASPAM). As a service company, they are actually carrying out some varietal testing, but mainly work with the individual growers to address problems which they are encountering. SASMA has experimental farms in numerous locations around the country, primarily in the Center region (Azzemour) and in the South (Ait Melloul). SASMA serves a dual role of extension-advisory service company and research-new product development agency. In this latter form, it is now receiving some funding from the MAMVA.

3. Institutional Limitations and Their Implications for the Fruit Industry

The Need for Consolidated Efforts in Fruit Production, Research, Teaching, and Extension

The existence of three separate government institutions involved in teaching, research and extension leads to fragmentation, lack of coordination, and worsens the problems of insufficient funding and duplication of effort. Developing the potential of Morocco's fruit industry will require a consolidated effort by horticultural education, research and extension.

Modern fruit crop production requires the development of a scientifically-and technologically-based system which begins in the plant nursery and ends in the retail market. This long and continuous chain of specific requirements must be met in order to maximize returns to the grower, especially in the competitive export market. The complex, systems approach required to develop the fruit industry of Morocco requires effective teamwork and cooperation involving researchers from numerous disciplines - regardless of their institutional affiliations - and organized around each major fruit crop.

The present tripartite system for fruit research, education, and extension does not lend itself to an integrated research approach to the major technical problems of the Moroccan fruit industry. The lack of an integrated approach to two of the fruit industry's major problems, the introduction of new varieties and production\marketing assistance, are described below as significant limitations in the potential expansion of the Moroccan fruit industry. With these descriptions are examples of approaches that are or could be taken in order to improve the status of fruit production in Morocco.

Example #1: Variety Testing and Introduction

Without appropriate organization or varying levels of cooperation, no systematic research has been done toward the introduction and testing (under Moroccan conditions) of newly developed varieties of the major fruit species. The INRA has introduced a number of varieties of apple, peach, plum, apricot, and almond, however, shortages of personnel as well as equipment and facilities for this relatively low priority subsector, have prevented rigorous evaluations. Yield data, when available, were recorded for only 1 or 2 years seasons at most. Furthermore, many such tests are conducted under marginal conditions of irrigation, pruning, pest control and fertilization, and no data are usually available for fruit characteristics related to quality and potential for storage or transport.

The experimental conditions of such trials make the data collected from them of limited value. Even so, the results from these evaluations, though incomplete and of limited value, are not published. Growers are eager to get new varieties very quickly and the slow pace of plant introduction and evaluation by INRA does not come close to meeting their expectations.

One of the most economical and rapid means for improving fruit production in a developing industry is through the testing and release of superior varieties. Plant breeding programs, especially for perennial horticultural crops, are expensive, long term investments. Many varieties with significant promise for Morocco have been developed elsewhere, usually with a large investment of institutional time and resources, and often with financial support of commodity groups. These varieties must be introduced into Morocco for testing and evaluation.

Potential Danger. The demand for new fruit varieties in Morocco is not just a quest for higher yields. Two major objectives of fruit growers in Morocco are to extend the season of harvest and to expand the regions of production. Much of the profitability in growing export fruit comes from early production for foreign markets when prices are high. As a result, many Moroccan growers are taking matters into their own hands and have been importing plant material for evaluation and commercial use. The danger with this trend, if it continues, is the potential introduction of insects or diseases which could destroy the very industries these practices are seeking to develop. New, and updated phytosanitary regulations must be developed for these developing fruit industries.

The other problem with the independent approach to plant introduction is the exclusion of smaller growers who cannot afford to travel abroad and import plant material. The introduction of plant material should be coordinated and controlled by the institutions involved in teaching, research and extension in collaboration with the fruit industry and under the direction of agencies charges with enforcing phytosanitary protocols.

A Possible Solution: It would be in the best interest of research institutions and the fruit industry to form an Advisory Technical Committee (ATC). Teaching and research institutions (INRA, IAV Hassan II, ENA, DVRA), and growers would all be represented in this committee. The committee would be responsible for plant material introduction. The importation would be done in full cooperation with colleagues at the "Direction de la Protection des Végétaux, des Controles Techniques et de la Repression des Fraudes" (DPVCTRF). The committee would make contact with the private or university breeder programs or nurseries producing the plant material and coordinate the obtaining of import\export permits and phytosanitary certificates from Morocco and the exporting countries.

Example #2: Production and Marketing - the Potential Role of Cooperatives

ADAME, introduced above, was created in part with a push from the INRA to serve as an industry collaborator with which INRA could carry out developmental work.

Variety Testing. ADAME has set as its objectives the use of selected and adapted plant material and to adopt improved techniques of production and plant protection for its members

The grower importing the plant material must declare to the "Protection des Végétaux" the site where the plant material is to be planted. The imported plant material of all species (except *Fragaria* and *Rubus*) must be grown at the same location for at least two complete growing seasons, where it can be inspected by the "Service de la Protection des Végétaux".

The introduction and importation of plant material of Rosaceous species must satisfy the conditions and requirements specified in the "Arrêté du Ministre de l'Agriculture et de la Mise en Valeur Agricole n° 824-93 (4 juin 1993)".

The Service de Contrôle des Semences et Plants

The organization is charged with the control and certification of seeds and plant material. Its responsibilities include organization and coordination of the nursery industry as well as the approval, control and certification of seeds and plants.

This organization's main activities include:

- Maintain the Official Catalog of plant species and varieties potentially grown in Morocco
- Maintain tests in the field and laboratory of seeds and plants in order to certify them. The certification includes the following species:
  - fall and spring cereals
  - forage crops
  - legumes
  - potato tubers, citrus, strawberry and olives
- Control of imported and exported seeds
- The maintenance of a database of organizations licensed to market seeds and plants.

  Prepare and implement measures of legislation and technical protocols related to the control of seeds and plants
  Research related to methods of evaluation of seed and plant quality.

SCSP Activities Related to Fruit Crop Nursery Plant Production: 1993

The major limitation to developing large-scale nursery plant certification programs for the fruit industry is the lack of nuclear, virus-free screenhouse collections of major cultivars for propagation and distribution. Progress in this process in Morocco is most evident in almonds. In addition, there has been some work in strawberries, citrus, and olives (see annex 12 for more details).

2. The Etablissement Autonome de Contrôle et Coordination des Exportations *(EACCE)*

The EACCE is present in all export operations for fresh product. It must technically approve any packing house which exports fresh fruit from Morocco. It should ensure that the packing house is organized to be hygienic, as well as having the technologies necessary to ensure good quality. All fresh exports must receive their approval.

Previous PagesBlank
pgs 69-70

In actuality, the EACCE concentrates its efforts on the major fresh products, tomatoes, citrus, and potatoes. Products like peaches and apricots which are exported in small quantities receive only a cursory examination, particularly since most of the exporters of these products are already being monitored for tomatoes and citrus. The EACCE's role has been primarily one of monitoring the exports.

Technically, the EACCE can be a very effective agency for enforcing growers to apply new technologies geared towards export, such as pre-cooling, new packaging, or even pest management, but this has not yet been their priority.

VI. CONCLUSIONS AND RECOMMENDATIONS FOR PROJECT ACTION

In recent years, the fresh fruit industry of Morocco has become one of the country's most dynamic agricultural subsectors. The potential for industry expansion is considerable and is driven by opportunities for exportation abroad and enhanced markets at home. There are a number of limitations imposed on this process by competitive market forces both at home and abroad, by institutional infrastructure within Morocco and by the producers themselves. After the major conclusions, the dominant driving forces in the subsector will be reviewed, leading up to the recommendations.

A. CONCLUSIONS

1. Morocco has considerable potential to produce a wide variety of fresh fruit crops both for national and export markets. However, the targets of opportunity in the export markets are highly specific and often compete with high prices in the local markets.

Morocco's climate and location are major assets for attacking the European market. It can export fresh fruit at times when regional supplies are low and prices are strong. Its proximity to Europe allows it to take advantage of reduced transport times and, occasionally, costs. However a number of factors limit the potential for fresh fruit export, such as transportation costs (for distant markets), trade regulations, lack of industry organization, and high demand on the local market, which currently consumes virtually 100 percent of apple, pear, cherry, and grape production.

The optimal target export periods for Moroccans attacking the European markets in general are:

PRODUCT	OPTIMAL REALISTIC EXPORT PERIOD
PEACHES	April, May and June production can capture 10 FF/kg
APRICOTS	Extend production to early May where prices reach 70 FF/kg in France and Germany.
STRAWBERRIES	Prices fall steadily from 24 FF/kg in January and February to 11 FF in April
RASPBERRIES	Prices in France and UK ranging from 55-70 FF/kg
GRAPES	Prices in July in France, U.K. and RFA: 7-7.5/kg.
MELONS	Prices range from 8 FF/kg (March) to 11 FF (April) and back to 8 FF (May) in France, German and UK
CHERRIES	Prices range from 10 FF/kg in May, to 8 FF/kg in July for the UK and German markets

2. For most fresh fruit products, Moroccan production and marketing channels are dominated by a few large vertically integrated firms, while the local market is supplied by both the smaller growers and these same vertically integrated growers.

The structure of the subsector is highlighted by two channels: large vertically integrated growers who account for most of the supply to the wholesale markets and for export and small growers who produce primarily for the local markets. The presence of the large vertically integrated growers presents a point of leverage for assisting the subsector.

The Moroccan fruit industry has proven that it can react to new opportunities involving significant investment. Synergies with the production, transport and marketing of other horticultural crops, such as tomatoes, have facilitated the ablitity of the large growers to develop other fresh fruit exports.

The bulk of the supply of fresh rosaceous fruits to the local market comes from the large growers who have invested in new plantations and control the capacity to store their production for sale later in the year. Meanwhile the traditional small holder products, like apricots and grapes, remain in the hands of the smaller growers.

3. There must be improvements in production and postharvest handling at all levels if Morocco is to be able to produce for the optimal marketing periods.

- *Many producers in the Moroccan fruit industry are depending upon imported technology which has yet to be fully adapted for optimal productivity under Moroccan conditions.*

Most of the technologies driving new product (strawberries, melons) growth have been imported by Spanish and French agribusinesses. Many large Moroccan producers have been very aggressive and creative in introducing new technologies and ideas into the fruit industry. However, they are realizing the constraints and limitations of using imported technology and are seeking ways to better adapt these technologies to their operations.

- *Obtaining new varieties is a critical factor for hitting the optimal marketing periods.*

The Moroccan fruit industry requires new varieties to improve yields, broaden regions of production and to extend the harvest season. The primary demand for new varieties lies in obtaining early ripening varieties for the export market.

Morocco has an underveloped program for the acquisition, evaluation and dissemination of new fruit varieties and rootstocks adapted to its climate, forcing the private industry to assume this function, which is not economically efficient.

4. A lack of good coordination between public institutions and private grower/exporters is reducing Morocco's ability to effectively develop production systems and adequate channels for the export of fresh fruit.

In general, the fruit industry lacks the ability to effectively market their products. While individual exporters are tied in to sources of market information, there is no consistent flow of information concerning market trends and product supply in world markets as well as within Morocco, which is available to the producer/exporters.

- *There are strong limitations in the land, air and sea transport channels by which Moroccan fresh fruit must reach its markets.*

Costs of transportation are high and often exacerbated by indirect costs. Options for routing are often limited and further reduced by poorly developed postharvest techniques for in-transit storage.

- *A greater level of cooperation within the fruit industry is required in order to effectively develop the potential of Morocco's export markets.*

Individual producers and organizations have successfully developed export marketing opportunities as independent entities. The potential for market expansion and long term sustainability by independent producers and organizations is limited as there must be a .

- *A lack of coordinated efforts among institutions providing education, research and service for the fruit production sector has greatly reduced potential benefits to the fruit industry.*

Public institutions lack sufficient resources to implement an integrated effort in research, education and service for more effectively assisting the tree fruit industry in its development. The lack of coordination among public institutions has led to fragmented and duplicated efforts, as well as inefficient use of scarce resources, and prevented the establishment of valuable partnerships and coalitions with the private sector.

5. The Moroccan fruit industry must implement new approaches to pest management in order to respond to serious realities in the areas of pesticide residues, environmental preservation and farm worker safety.

In general, the Moroccan fruit industry practices preventative pest management which leads to excessive and inappropriate uses of chemical pesticides. While some producers are slowly incorporating certain elements of integrated pest management (IPM) into their production, many producers neither understand or appreciate the principles and feasibility of such practices.

There is a strong need for education and guidance in the use of chemical pesticides in order to protect the health and safety of Moroccan farm labor as well as for the preservation of the environment.

B. DRIVING FORCES

The main forces, both positive and negative, which are driving change in the fresh fruit industry in Morocco are: market demand (both local and for export); increasing industry

sophistication; new methods of transport; lower costs of labor; foreign investment; and varietal introductions.

Market Demand. In spite of a recent drop in imports from the major consuming countries, there has been a steady increase in imports of fresh fruits by the countries of the European Union. Inside Morocco, there has been a steady demand for fresh fruit, with little exactitude for quality or packaging. This dual demand from within and without is leading more growers to invest in fresh fruit production which will eventually

The nature of the internal demand, with few requirements for quality and packaging, is a handicap for developing the tools and standards for export production.

Industry Sophistication. Among the products planted annually, like melons and strawberries, the large integrated grower/exporters have been able to react to the increased market demand for these products and put in large quantities of production at a time.

Transport. The development of refrigerated trucking for fresh vegetables (primarily tomatoes) has spilled over into the fresh fruit exports, developing the potential for melon and strawberry exports by truck. However, the cost of transport is still very high by all standards for Morocco's fresh products, which hurts its competitiveness.

The nature of the transport also dictates the structure of the economically viable exporter as well as the markets which can be reached. For strawberries, for example, a minimum of 25-30 hectares is required to be able to fill a refrigerated truck on a seasonal basis, making that the size of minimum viable fresh strawberry export farm. The inability to maintain product freshness over long transport distances has limited Morocco's ability to attack many markets other than the European market.

Foreign Investment. There has been an important investment by Spanish growers in the Northern part of Morocco, both as wholly owned companies and in partnership with Moroccan growers, for strawberry production. Meanwhile in the South, in the Souss-Massa, French and Spanish firms have been working with the large Moroccan exporters to develop synergistic supply relationships. These partnerships have brought technology, financing, and market contacts.

Varietal Introductions. One of the most important constraining factors has been the lack of new varieties being introduced and tested in Morocco. Morocco has an underdeveloped program for the acquisition, evaluation, and dissemination of new fruit varieties and rootstocks adapted to its climate. As a result, the growers are required to do their own testing. This has greatly slowed down the introduction and spread of new varieties.

Organization of the subsector. The lack of a coordinated effort among the institutions and growers in the subsector to work together on the introduction of new services and varietal introductions has slowed the overall rate of progress and Morocco's ability to present a united front in the export markets..

Lower labor costs. Morocco's lower labor costs and its proximity to Spain have been an important force driving the transfer of production from Spain to Morocco. These lower labor costs provide Morocco with a competitive edge for labor intensive products, such as strawberries, raspberries, and other small fruits.

C. RECOMMENDATIONS FOR PROJECT ACTIONS

1. Provide marketing assistance to the private sector: Assist the private sector in developing the ability to effectively market their products.

Proposed project actions:

- Increase contacts between Moroccan exporters and European buyers and the awareness of the distribution networks and quality requirements in the non-traditional markets.

- provide training to Moroccan firms to develop both short and long term marketing strategies.

- Facilitate the development of marketing databases which are continuously maintained and updated, and accessible to the private sector. Sponsor an informational meeting where private sector representatives can articulate their needs with regard to marketing information. Public sector represenatives can respond by discussing currently available sources of information. The anticipated outcome of such a meeting would be the initiation of a dialogue between information managers and users.

- Determine new product mixes and processes which could expand the marketing seasons for several of these products, such as raspberries following strawberries and the development of freezing stations to stretch the strtawberry season.

2. Help to obtain, evaluate, and disseminate new fruit varieties in order to facilitate the development of an effective program for the acquisition, evaluation and dissemination of new varieties and rootstocks for the Moroccan fruit industry.

Proposed project actions

- Assist private and public partners to make contacts with fruit breeding programs throughout the world through enhanced information and organized visits. This should include organizing a trip or series of trips for public and private individuals associated with Moroccan fruit production. These trips should include visits to public and private breeding programs and nurseries.

- Assist growers and public authorities to develop a national nursery system by rendering technical assistance in areas such as horticulture, phytosanitary and business management. This might include sponsoring visits by specialists in a number of

relevant disciplines in order to assist in the development of a national nursery system for Morocco.

Under the USDA PASA component of the overall project:

- Initiate a study to identify the most effective partnerships and coalitions among national and international public and private agencies for the acquisition of new germplasm for Morocco.

  Enlist the assistance of specialists within organizations who currently maintain linkages with Moroccan public institutions such as FAO, World Bank, US AID, etc., and expand those linkages with arrangements for technical assistance from institutions such as the USDA-ARS National Clonal Germplasm Repository System.

  The result of strengthened partnerships would be activities such as educational visits to germplasm repository locations in the United States in order to study organization and implementation of a germplasm program.

3. Develop efficient and economic options for product transport.

Proposed Project Actions

- Sponsor and co-finance (through the PIF) research and commercial trials with grower/exporters and transport companies to adapt the existing technologyies for controlled and modified atmosphere to improve the life span of product under different modes of transport which will allow Moroccan fresh fruits to reach distant markets. Some examples are controlled atmosphere for melons, modified atmosphere for peaches or apricots.

- Continue the work which has already been started on modifying the policy environment surrounding transport, which is addressing regulations, pricing, and logistics.

4. Assist the public and private sectors in fruit production technology transfer and adaptation.

Proposed project actions

- Initiate exchange visits between Moroccan specialists and their public and private counterparts in technology-exporting countries.

- Encourage cooperative projects between public institutions and progressive growers who actively import and adapt production technologies from other locations.

- Explore graduate student internships as a model bridge between the institution and the grower. More formalized relationships with long term goals extending beyond the

student's degree program will imporve current implementation of such cooperative efforts.

- Organize an industry awareness trip to the United States, centered around a seminar for fresh fruit postharvest handling.

- Facilitate the establishment of long term relationships between the private sector and a broad range of vendors and service providers within and outside of Morocco.

- Continue work which has been undertaken to spread the production of raspberries and introduce new strawberry varieites, as well as other plant material.

5. Develop educational and technical strategies for improved efficiency and reduced health and environmental risks concerning pest management

Proposed project actions:

- Initiate an analysis of pest management practices in Moroccan agriculture in order to assess inefficiencies as well as potential environmental problems.

- Assist in the development of strategies to understand and subsequently react to new pesticide residue standards and regulations such as those to be implemented by GATT in 1995.

- Sponsor a series of workshops and field days for the fruit industry in which the subjects of pest management, phytosanitary regulations and standards for export, worker safety, and risks for human health and the environment are discussed in an informational yet nonthreatening manner.

- Promote formal training of agricultural technicians on these issues in the U.S.

LIST OF ANNEXES

Annex One:	Firms Contacted during the study
Annex Two	Producer Outlooks
Annex Three	Profitability Calculations
Annex Four	Varietal Descriptions
Annex Five	Strawberry Production in Morocco
Annex Six	Grape Production in Morocco
Annex Seven	Production Techniques by Product in Morocco
Annex Eight	Local Wholesale Market Prices
Annex Nine	Wholesale Market Information in Rungis, Covent Garden, and Hamburg
Annex Ten	Moroccan Fresh Fruit Exporting Companies
Annex Eleven	Cold Storage Information
Annex Twelve	Research Topics covered at the IAV and DPVCTRF Nursery and Plant control procedures.
Annex Thirteen	Moroccan Fresh Fruit Exports by Market

ANNEX ONE

PERSONS CONTACTED DURING THE FRESH FRUIT SUBSECTOR STUDY

Person	Company	Location
Michel AYELLO	Dir. Général, Arbor Oulmes,	Casablanca
PUESCH	Azura	Agadir, 08-84-10-53
SEBTI/HAMDAOUI	Grands Moulins de Fes	Fes, 05-64-10-01, f: 64-29-44
Abdou AZIZ	Directeur Général. ABAZ,	Kenitra
Abderrazak MOUISSETT	President de Agrisouss,	Agadir
Mme ZOHR	Société Delassus,	Casablanca
Fouad ABDELJALI	APEFEL	Agadir, (08) 24-34-54, fax 24-34-56
M. Aboubakr BELKORA	ADAME	MEKNES, (05) 51-36-80
M. BENZIT	Fermes BENZIT	Taroudant
Ernest PERRET	Pepinieristes Associes,	Casablanca
Moussaoui HAMID	SODEA,	Rabat, 07-77-64-08
M. LAGHAZALI	INRA,	Meknes
HAJJIOUI, Ahmed	SED	Fes, 05-62-19-09/24-97
Luis SALLANT	KeniExport	Kenitra, 07-36-50-13
Iszhak AYELON	AMARIS,	Chtouka (Azzemour)
Olivier GOUSSIEZ	Groupe Znieber	Meknes
M. ZNIEBER	Groupe Znieber	Meknes
Juan PICHARDO	ESMAFRAISE	Moulay Boussalem 07-37-22-61
Sahar Mejbel	strawberry grower	Moulay Boussalem (07)-75-46-09
Alexander BEXTER	BGSN	Moulay Boussalem
	ALCONERA	Moulay Boussalem
Entire Cooperative	Cooperative CAAY	MEKNES
Government Groups		
M. Maghdad	MAMVA, DPV/DH	Rabat
M. Berichi	MAMVA, DPV/DH	Rabat
M. Bennani	MAMVA, DPV/DMVIA	Rabat
Kabbaj	DPA Meknes	Meknes
M. Zouhry	INRA	Rabat, 07-77-16-71
	DPVCTRF	Rabat/Bouznika

81

ANNEX 2

PRODUCER OUTLOOK ON THE PRESENT AND FUTURE OF MOROCCAN FRUIT PRODUCTION

There are six major issues in Moroccan fruit production which have been observed to be of critical importance to the future of this industry. These issues are not necessarily listed in order of importance or priority:

- **Marketing:** Exploit and retain new foreign markets
- **New Variety Acquisition:** Obtain new fruit varieties adaptable for Morocco
- **Product Transport:** Cost effective methods for exporting quality fruit
- **Adapting Imported Technology:** Making new technology work in Morocco
- **Management Personnel:** Find, train and retain good managers
- **Pest Management:** Alternative strategies, residues, worker exposure

What follows are discussions of these issues framed by a number of quotes articulated by many Moroccan fruit producers which reflect their attitudes and concerns.

1. *MARKETING*

Most of the producers interviewed were primarily concerned with issues related to marketing their products in a fiercely competitive environment in which Morocco has distinct disadvantages in terms of distance and transportation, product recognition and public relations and product perception.

"I don't need help with production. I can grow these crops - what I really need help with is where to sell them. Find me the markets!"

There is a general feeling of uncertainty among producers. Examples include the changing structure and size of competing industries worldwide, factors influencing importation into Europe, specifically the impact of GATT on the regulation of product flow, barriers to new markets such as North America and the Pacific rim, and in general, what consumers in new and existing markets want.

"I'll grow anything anyone asks me to grow for export."

Uncertainty translates directly into the decision-making process. It causes some producers to concentrate on short term gains by trying a variety of crops as "insurance" because competing producers are already growing them. Early peaches and strawberries are good examples of this as rapid expansion in these commodities is driven partly by what the competition is doing. It also causes some producers to take what they see as "safer" approaches. For example, while one organization sees grapes as a 10 year cost recovery, tree fruits in 14 years and olives in 20, their available land will probably be planted in Morocco's largest crop - olives. This is due to being able to get into production within 3-4 years, and a perception that other countries like Spain and Italy are pulling out of

production which should change the world market and create an opportunity for Morocco.

"Morocco's biggest competition is Morocco."

"Morocco does not speak with one voice."

This concern is rather self-explanatory. There is little cooperation in the fierce battle to obtain high prices for export crops in Europe. This relates to every aspect of production including varieties, technology and marketing strategies. Some growers are restricting access to their farms in an effort to avoid assisting their competition in any way. With some form of cooperative effort or solidarity, particularly in marketing, greater inroads in export markets could probably be made to the advantage of all producers.

"Regardless of what label name I use in Europe, my product is first looked upon as being Moroccan."

Some producers say that there is no brand or label recognition with buyers in Europe, just labels like "Spanish quality" and "Moroccan quality". With all Moroccan fruit being seen as the same product in Europe, it creates even more competition among Moroccan producers.

"Don't tell me about yield, tell me about quality."

In one company, this is a phrase being used constantly to get a message across to production personnel. They are to focus on a quality product as that is often the only thing which will make them distinct in the export market, as well as in retaining current customers. A practical manifestation of this philosophy for this company will be a policy of not sourcing any fruit from outside the company. They will produce all of their own fruit in order to insure the quality of what they sell.

"I care more about being on the early market than the quality of my product."

In many cases, growers are targeting as much of their crop for the early season export market as possible. This fruit brings the highest price and even can allows the earliest growers to have some control over price given the supply and demand relationships at work when little product is on the market. As a result, for some growers, quality is less of an issue than timing on the market. Eventually, as more growers achieve earlier windows of production and competition in early markets increase, the issue of quality will inevitably become more important.

"The commissioners are killing us."

This is a common complaint among Moroccan producers relying on brokers to sell exported produce. Producers feel that the amount of money charged for their services is exorbitant and that these individuals do not always have the producers best interest at heart. After all of the labor and resources spent in producing the crop and getting it to market, producers often feel distanced from the process of selling their crop.

2. *New Variety Acquisition*

This is a major concern for all of the fruit producers and is of particular concern to those growing perennial tree crops which require a number of years to come into full production. Finding, acquiring and testing new varieties can be an expensive and often frustrating process.

"I need access to new varieties."

In the case of tree fruit growers seeking the earliest export fruit possible, a few days can make a tremendous difference in price. While larger producers will fly to Europe and the United States to look at breeding programs and nurseries, it does not in any way guarantee them access to promising new varieties which they would like to try in Morocco. In the end, most producers shop around the world and get to know each nursery's specialty.

"Large companies are buying the rights to new varieties and keeping other growers from getting access to them."

This is a difficult situation for everyone involved. University and private breeding programs in the United States want to both distribute their varieties and protect their own interests through patents. For example, once a Spanish company buys the rights to a variety, they may distribute material to Moroccan growers according to their own agenda by controlling the number or quality of plants sold - perhaps even specifying when a variety is produced and marketed. The use of patents to control industry competition is a concern for producers in Morocco who see the future of new varieties in some cases lying in the hands of the highest bidders.

"Oh, that's the name I gave that variety."

"I can't say where I got that variety."

"I have ways of getting the plant material I want."

As a result of the difficulties of getting access to new plant material and in an attempt to bypass international bureaucracy, many growers have plant material in their fields of origins they are not willing to discuss. On one hand it is easy to see why growers are frustrated and growing desperate over this situation as obtaining a new variety is only the first step in finding out if it is adapted to Morocco. On the other, it is disturbing to know of widespread distribution of named varieties and numbered breeding selections from programs places like California, Texas and Florida. It is somewhat ironic to hear a grower bitterly complaining about the quality of bootlegged plant material.

"Remember, Morocco is not a signatory on international patent agreements."

This reminder poses a problem for breeding programs around the world as well as for the fruit industry of Morocco. Patented varieties can, are, and will be freely propagated and distributed without payment of royalties to the releasing institution. This is an issue of great

concern internationally among genetic improvement programs and must be considered as a factor in the development of Morocco's strawberry fruit and plant production industries. Intellectual property rights in plant breeding are facing many challenges internationally. New varieties being patented often have genetic backgrounds partially derived from native and improved germplasm from other countries. Many producers resent the principle of paying royalties. In reality, there is really little that a patenting institution can do about patent infringement like this.

"Variety procurement and testing should be done by the private sector."

In general, larger producers would prefer to keep variety procurement and testing at the private level. Their concerns over institutionalizing the process include the amount of time it will take, the resources they already have invested in their own research and development as well as the potential results of having promising varieties widely planted across the industry and killing potential market niches. The reliance of a large export market on a single variety such as happened in Morocco with the 'Daniella' tomato is much on producers minds. The local market has become flooded with 'Anna' apple and is especially painful in long-lived perennial tree crops. The general perception seems to be that government agencies like the Ministry of Agriculture and INRA will be too slow, and, that while the university may be faster, it would still not be nearly as efficient as the independent, albeit selfish approach already used by producers. Smaller producers also do their own variety trials in order to identify varieties adapted to their area, but seemed more willing to cooperate with a public agency who would collect, preserve, maintain and evaluate germplasm.

On one hand, most producers understand the risks inherent with having an "open door" policy for horticultural crop germplasm and the threat that this can pose to an industry. On the other hand, most producers aren't willing to rely on an organization outside of their own to acquire and test varieties.

3. *Product Transport*

While Morocco is strategically positioned geographically to market its products to North America, Europe and the Middle East, barriers to market expansion are not all about quotas, tariffs and too many intermediaries. None of the available shipping options - land air or sea - are without their share of problems or impracticalities. In general, there is a tremendous lack of coordination among various parties as to the available cargo space, the flow of product, and the infrastructure of how and where product is marketed.

"You don't load a shipping container for a boat the same way that you load a truck."

This quote from a producer exemplifies the need for information on how to send exported fruit by ship in containers. He was willing to try shipping melons to Chicago by container but had no idea what he needed to do in the way of packing and loading his product. He was willing to try new ideas and technology such as modified or controlled atmosphere shipping as he already had lost a number of loads by boat. Modified and controlled atmosphere shipping in containers is relatively unexplored for Moroccan producers and will have to be

considered in their quest to reach distant markets by sea.

"Air export to North America is limited by current tonnage capacities on those routes."

Currently, the Ministry of Agriculture subsidizes the air shipment of exported agricultural products by 10% to Europe and 30% to North America. This was discussed by a representative from Royal Air Maroc who said that while air transport was not cheap, it was not exorbitant given the costs involved. He said that the major problems were actually the volume of cargo space available, routes and connections. For example, he said that on a weekly basis, 280 tons of air shipments were available to Europe (176 tons to France). In contrast, for growers trying to reach New York and Montreal, that only 30 tons of space were available to both cities each week. While some producers ship successfully by air, others do not consider it due to varying realities and perceptions concerning costs and logistics.

"We need to reduce the extra costs, duties and assessments charged by Spain and Morocco which greatly increase the cost of shipping to Europe by truck."

This producer\exporter expressed a widely held concern over the costs associate shipping to Europe by truck. Most of these trucks go to the distribution hub in Perpignan, France. Moroccan trucks aren't allowed to haul a return load out of Europe, thus Moroccan trucking is limited. Basic trucking costs to Europe are $4,000-5,000 per load, and up to a third of that cost can come from the six mile journey between Morocco and Spain. However, this producer claims that extra costs and assessments by Spain and Morocco drive the total closer to $6,000. This is particularly frustrating for overland exporters when the same government subsidizing air freight is imposing an extra financial burden on other forms of export transit.

4. *Adapting Imported Technology*

As production methods and new varieties are brought in from other parts of the world, some limitations are experienced in trying to make adjustments in adapting these systems to the Moroccan climate and production infrastructure.

"One of my biggest problems is the use of imported technology."

Minor differences in local climate, availability of production system components and quality of local management personnel can make a tremendous difference in how well new technologies are adapted in a new location. Growers who expect complex systems and technology to be seamlessly integrated in a new environment like Morocco are often disappointed. In general, while many of these systems have been transplanted with significant success, the hard work comes in refining these systems to accomplish specific Moroccan objectives such as producing for earlier markets.

Management Personnel

A number of producers expressed frustration with not being able to find, train and retain good managers within their organizations.

"One of my biggest problems is finding an effective way to train personnel."

The need for better trained personnel was apparent in many aspects of Moroccan fruit production from planting to harvest. Larger organizations hire university-educated production mangers within Morocco or from France or Spain. Other producers rely on individuals who started as farm labor and learn by experience over the years. While these employees are often excellent workers and horticulturists, they are not always adept at adapting new technologies or radical changes in cultural management strategies. Some larger producers lack the time to practice adequate quality control in worker training.

"I asked my university-educated manager to teach workers how to prune trees and he could not do it himself."

University educations were not always held in high regard by producers, and some expressed the desire to find less educated, yet motivated people to train who could learn to understand the objectives of cultural management and train others. These comments are reflective of a generally low opinion which Moroccan producers seem to have hold about public research, teaching and extension institutions.

5. *Pest Management*

While there seems to be a general consensus that this issue will become increasingly important in the future, few producers feel any urgency to make major changes in current phytosanitary practices. Residue standards are something that most exporters are aware of with regard to import restrictions, however, environmental concerns or worker health and safety issues are not a priority for most producers.

"We really have no pest problems."

"We spray on a schedule - purely preventative."

It is difficult to talk to Moroccan fruit growers about pest management issues. In general, unless there is a major problem such as infested planting stock or a history of soil borne pathogens, growers do not seem very concerned about pest problems. Few if any significant pest problems were observed. The reason for this is the level of preventative pest control which is practiced. Most growers spray from a schedule every 10-15 days regardless of the presence of pest problems. These schedules may synthesized from a number of sources and may not always take into account the phenology of the crop or the pest. It is likely that many unnecessary pesticide applications are made in the Moroccan fruit industry.

"IPM? Integrated Pest Management? What is that?"

When asked about practicing IPM, approximately half of the growers were not familiar with the principle or did not seem to care about the concept. The other half were either doing

some IPM, were planning to start or were very interested and realized that they would have to do this in the future. Pest scouting is done later in the season by some growers after initially preventative spray schedule to keep problems from establishing itself, and as the season continues, some treatment decisions may be based upon on pest populations.

"We are beginning to use Integrated Pest Management."

A few growers were identified who are currently using biological pesticides (*Bacillus thuringiensis*), predator insects, traps (codling moth) or nonchemical alternatives on a limited basis. Some producers are moving into IPM slowly because sometimes "a neighbor's problem becomes ours". Some producers say they will be practicing more effective IPM within three years. Perhaps the most important element of integrated pest control for Moroccan growers to learn is that of pest scouting. Instead of a rigid schedule of preventative sprays, growers could learn to monitor pest populations in their fields and determine the appropriate time to intervene with chemical treatment. This approach is being used somewhat by certain growers, but many growers could reduce pesticide usage significantly (reducing expenses and human exposure) and in some cases increasing plant performance and perhaps allow native and introduced beneficial organisms to act. Some producers have reduced sprays through scouting. The major problem is incentive. In certain cases, the cost of pesticides is a relatively small percentage of the total production costs relative to the perceived assurance of higher yields and fewer fruit quality problems.

"We are aware of these issues and plan to make changes."

Vertically-integrated export growers are aware of pesticide residue standards to be set by GATT beginning in 1995. They must begin to look ahead to future strategies for dealing with pest management practices which may reduce the export potential of their crops. Regulations and standards being developed in the United States will also force anyone considering that market to carefully evaluate pesticide usage from both a legislative and consumer preference standpoint.

"Germs picked up by fruit in transport pose a greater hazard to the consumer than any pesticide residues growers may leave on fruit."

Among some growers, there was a general feeling that while pesticide use in food crops was a societal concern in Europe, that the United States was more "hysterical" about these issues and that "it is a problem with the way that Americans think." While there is likely some truth in this observation, it did not appear to be made from the standpoint of negotiating for a balanced approach and rational thought.

"Pesticides don't present any serious hazard to farm workers."

"Would you be afraid to apply pesticides as you have seen done here?"

There seemed to be a very cavalier attitude toward the use of pesticides and the potential risks involved with human exposure. Much of this is due to a lack of education and a poor understanding of what pesticides do. During the study, farmworkers were observed spraying

88

by backpack sprayers, airblast sprayers, boom sprayers and guns without any protection aside from work clothing. Workers were observed spraying the trees and exposing themselves to runoff. One industry observer confirmed that while not having firsthand experience with a single case of pesticide poisoning, that there were plenty of stories told about sickness and even death among farmworkers. The only time any protective measure was observed during a pesticide application was a paper mask worn over the mouth of a worker making an airblast application in short sleeves and without a hat. When asked if I would be afraid to apply pesticides as a farmworker does in Morocco, I said absolutely. A long explanation was given as to accumulation of chemicals in fatty tissues, metabolites and carcinogens, but this only led to the overwhelming realization of the magnitude of reform necessary in order to safeguard Moroccan farm workers from a threat they do not understand.

"I'll just keep spraying pesticides and eating plenty of my fruit!"

This was the tongue-in-cheek response from a grower after telling him about some of the anticarcinogens being found in various fruit crops.

ANNEX 3

PROFITABILITY CALCULATIONS FOR FRUITS

A. PEACHES AND NECTARINES

1. Establishment costs

A general budget illustrating establishment costs for peach production is outlined in Table 1. The establishment costs will vary depending on the plant density, training system and type of irrigation system.

Table 1. General budget for establishment costs for peach production in Morocco.

OPERATION	COST (DH)
Labor	5,000
Equipment (Tractor, etc.)	5,000
Fertilizers	5,000
Plants (1250 x 10 Dh)	12,500
Irrigation Equipment	30,000
Finance Costs	4,500
Total	**62,000**

2. Production costs and yield

Yield depends largely on the variety, soil and climatic conditions, cultural practices and management skills. An estimated budget for production (Table 2) and the estimate of potential returns which follow illustrate the overall profitability potential of peach production in Morocco.

Table 2. General budget for peach production in Morocco.

OPERATION	QUANTITY	UNIT PRICE Dh	TOTAL VALUE
Labor	170 days	35	5600
Fertilizers			2000
Equipment			1000
Pesticides			4000
Irrigation	5000m^3		2000
Fixed costs			
Land Rent			3000
Amortization			2000
Finance costs			1400
Total Cost			**21,000**

3. General Costs and Returns:

Assumptions
The average yield for early peach varieties is 18 T/Ha.
The cost of production for peaches is approximately 21,000 Dh/Ha, 1.17 Dh/Kg.
Early peaches are grown for both local and export markets.

a. Export market production

Early peach varieties for export are sorted, packed, and shipped by frigo truck.

Handling and packing cost	1.70 Dh/Kg,
Trucking cost	1.70 Dh/Kg.

Assuming 40% of the crop is sold for export:
18,000 x 0.40 x 20 Dh/Kg = 144,000 Dh
The remaining portion of the crop is sold on the local market:
10,800 kg x 3.50 Dh/Kg = 37,800 Dh.
Total sale price for export and local market is:
144,000 + 37,800 = 181,800 Dh.
Total packing and transport costs for export is:
(1.70 + 1.70) x 7,200 kg = 24,480 Dh.

For the local market peaches are sized in the field with minimum packaging. However, we will consider that the grower handles and packs his product. The cost for handling packing and transport for local market will not exceed 0.75 Dh/kg, thus the total cost for local market would be:
10,800 kg x 0.75 Dh/kg = 8,100 Dh.
The total cost for handling, packing and transport for export and local market is: 24,480 + 8,100 = 32,580 Dh.
The overall cost of Production + Handling and packing + Transport is: 21,000 + 32,580 = 53,580 Dh.

The overall return from early peach production of which 40% is exported and the remaining sold in local market would be the Total sale price export + local - The overall cost, which is:
181 300 - 53,580 = **128,220 Dh.**

b. Early peach production for local market

Early peaches may be sorted, sized and packed before being shipped to a wholesale market. Handling, packing and transport costs are 0.5 Dh/kg.
The handling, packing and transport cost for one hectare of production is:
18,000 kg x 0,5 Dh/Kg = 9,000 Dh.
The total cost (production + handling and transport) per hectare is:
21,000 + 9,000 = 30,000 Dh.
The sale price is 18,000 Kg x 5 Dh/kg = 90,000 Dh.
The return from one hectare of early, local market peaches is:
90,000 - 30,000 = **60,000 Dh.**

c. Late peach varieties for local market

The yield for late peach varieties can reach 25 T/Ha.

The cost of production is	0.84 Dh/kg.
The cost for handling and sizing in the field and transport is	0.5 Dh/kg.
The handling, packing and transport cost for one hectare of late production is:	
25,000 kg x 0,5 dh/kg =	12,500 Dh/kg.
The total cost of production, handling and transportation for late peaches is:	
21,000 + 12,500 =	33,500 Dh.
The sale price of late peaches at 25,000 x 4 dh/kg =	100,000 Dh.
The returns from a hectare of late peaches will be:	
100,000 - 33,500 =	**66,500 Dh/Ha.**

B. APPLES

1. Establishment costs

A general budget illustrating establishment costs for apple production is outlined in Table 3. The establishment costs will vary depending on the plant density, training system and type of irrigation system.

Table 3. General budget for establishment costs for apple production in Morocco.

OPERATION	COST (DH)
Labor	5,000
Equipment (Tractor, etc.)	5,000
Fertilizers	5,000
Plants (1250 x 18 Dh)	23,000
Irrigation Equipment	30,000
Finance Costs	7,000
Total	**75,000**

2. Production costs and yield

Yield depends largely on the variety, soil and climatic conditions, cultural practices and management skills. An estimated budget for production (Table 4) and the estimate of potential returns which follow illustrate the overall profitability potential of apple production in Morocco.

92

Table 4. General budget for apple production in Morocco.

OPERATION	QUANTITY	UNIT PRICE (Dh)	TOTAL VALUE
Labor	260 days	35	9100
Fertilizers			3000
Equipment			2000
Pesticides			8000
Irrigation	7000m^3		2800
Fixed costs			
Land Rent			3000
Amortization			3000
Finance costs			3000
Total Cost (dh			34,000

3. General costs and returns:

1. Early varieties

The average yield for a a well managed mature apple orchard is 30T/ha for early varieties.
The production cost for apple is approximately 1.15 Dh/Kg.
The average sale price at the farm gate is 3 Dh/Kg or 90,000 Dh/Ha. The early apple varieties sold to local market without any storage provide a profit of about 56,000 Dh/Ha.

2. Late Varieties

Late apple varieties have higher yields than early varieties at about 40 T/ha.
Late varieties are stored for 4 to 6 months before they are sold.
The production cost for late apple varieties is 0.85 Dh/Kg.
Losses during storage are estimated to be 10%
The storage cost 0.15 Dh/kg x 5 months of storage is 0.75 Dh/Kg.
Handling and packing cost are 0.75 Dh/kg.
Transportation costs are approximately 0.20 Dh/kg.
The total costs after harvest are 1.70 Dh/kg.
The total cost including packing and transport are approximately 2.55 Dh/Kg.
The average total cost per hectare production is
40,000 kg/ha x 2.55 = 102,000 Dh
The average sale price after storage is 6 Dh/kg.
The sale price of 40,000 Kg x 0.90 (for 10% loss) x 5.5 Dh = 180,000 Dh/Ha.

The average profit of a well-managed apple orchard with appropriate storage facilities is approximately **78,000 Dh/Ha.**

93

Table 5: Profitability of Apple Production

ITEM	COST
Cost of Production	21,000
Handling/packing/ transport	12,500
Sales Revenue	100,000
Profit	66,500

C. PEAR

1. Establishment cost

A general budget illustrating establishment cost for pear production is out~~hned~~lined in Table 6

Table 6: General budget for establishment costs for pear production in Morocco.

OPERATION	COST (DH)
Labor	5,000
Equipment (Tractor, etc)	5,000
Fertilizers	5,000
Plants (1250 x 16)	20,000
Irrigation Equipment	30,000
Finance costs	5,000
Total	70,000

2. Production cost

Yield depends largely on the variety, soil and climatic conditions, cultural practices and management skills. An estimated of potential returns which follow illutrate the overall profitability of pear production in Morocco.

94

Table 7. General budget for pear production in Morocco.

OPERATION	QUANTITY	UNIT PRICE (DH)	TOTAL VALUE
Labor	230	35	8,000
Fertilizers			3,000
Equipment			2,000
Pesticides			7,000
Irrigation	7 000 m3		2,800
Fixed costs			
Land Rent			3,000
Amortization			3,000
Finance costs			3,000
Total			**32,000**

3. General costs and returns

The costs of production for pears is 32,000 DH/ha.
Pears are either sold right after harvest or stored in cold or CA rooms and sold later on.

a. Pears sold after harvest.

The average yield of mature pear orchard is 25 T/ha.
The production cost is 1.28 Dh/kg.
The average sale price at the farm gate is:
25,000 x 3 Dh/kg = 75,000 Dh/ha.
Production costs is 32,000 Dh/ha.
The return from one hectare of pear sold at the farm after harvest would be
75,000 - 32,000 = 43,000 Dh.

Table 8: Profitability of Fresh Pear Production

ITEM	COST
Cost of Production	32,000
Handling/packing/transport	
Sales Revenue	75,000
Profit	**43,000**

95

b. Pears stored for 4 to 6 month (Passe Crassane)

The average yield is 30 T/ha.
The production cost is 1.10 Dh/kg.
Losses during storag are estimated to be 10%.
The storage cost 0.15 Dh/kg x 5 months of storage is 0.75 Dh/kg.
Handling and packing costs are 0.75 Dh/kg.
Transportation costs are 0.20 Dh/kg.
Total after harvest cost 1.70 Dh/kg.
The total cost including production packing and transport are 2.8 Dh/kg
The average total cost per hectare production is
30,000 kg/ha x 2.8 = 84,000 Dh.

The average sale price after storage is 5.5 = 148,500 Dh.
The return from one hectare of pear production sold after 5 month storage

148,500 - 84,000 = 64,500 Dh.

Table 9: Profitability of Stored Pears

ITEM	COST
Cost of Production	33,000
Storage Cost	22,500
Losses during Storage	3,300
Handling/Packing/Transport	25,650
Sales Revenue	148,500
Profit	**64,050**

D. SWEET CHERRY

1. Establishment costs

A general budget illustrating establishment costs for sweet cherry production is outlined in Table 10 The establishment costs will vary depending on the plant density, training system and type of irrigation system.

Table 10. General budget for establishment costs for sweet cherry production in Morocco.

OPERATION	COST (DH)
Labor	5,000
Equipment (Tractor, etc.)	5,000
Fertilizers	5,000
Plants (500 x 30 Dh)	15,000
Irrigation Equipment	30,000
Finance Costs	5,000
Total	**65,000**

2. Production costs and yield

Yield depends largely on the variety, soil and climatic conditions, cultural practices and management skills. An estimated budget for production (Table 11) and the estimate of potential returns which follow illustrate the overall profitability potential of sweet cherry production in Morocco.

Table 11. General budget for sweet cherry production in Morocco.

OPERATION	QUANTITY	UNIT PRICE Dh	TOTAL VALUE
Labor	120 days	35	4200
Fertilizers			1500
Equipment			1000
Pesticides			3000
Irrigation	$5000m^3$		2000
Fixed costs			
Land Rent			3000
Amortization			2000
Finance costs			1300
Total Cost			**18,000**

3. General Costs and Returns:

The cost of production for cherries is 18,000 Dh/ha.
The average yield of mature cherry orchard is 20 T/Ha.
The production cost is 0.90 Dh/kg.
Cherries are produced both for local market and for export.
The percentage of the crop exported depends largely on the ripening period. Moroccan growers can export cherries to Europe early in the season before entry prices are applied. The entry prices take affect starting 21 May at approximately 12 FF (11.97 FF).

Unfortunately, of the cherry varieties currently grown in Morocco, very few (Burlat and Moreau) ripen by mid-May and can be exported. Other export markets for cherries are found in the Middle East.

Cherries for export and local market

Export market. Exported cherries are handled and packed at about 1 Dh/kg.
The transport cost by air is 9.5 Dh/kg.
The cost for handling, packing, and shipping is thus 10.5 Dh/kg.
The proportion of cherries exported could vary from 20 to 25% of the crop. This amount can be increased if new early, low chilling varieties became available.

The export tonnage is potentially: 20 T x 0.25 = 5T/ha.
The cost for handling packing and shipping the exported portion of the crop is: 5,000 Kg x 10.5 Dh/Kg = 52,500 Dh.
The average sale price is 5,000 Kg x 25 Dh/Kg = 125,000 Dh

Local Market. The remaining production is sold on the local market
The handling and shipping cost within country would not exceed 0.75 Dh/Kg.
The cost for handling and shipping per hectare production for local market is:
15,000 kg x 0.75 Dh/Kg = 11,250 Dh.
The average sale price on the local market is: 15,000 x 4 = 60,000 Dh
The total cost (production, handling, shipping for local and export market) is: 18,000 + 52,500 + 11,250 = 81,750 Dh.
The total sale price for local and export market is: 125,000 Dh (export) + 60,000 Dh (Local) = 185,000 Dh
The return from one hectare of sweet cherries would be:
185,000 Dh - 81,750 = **103,250 Dh.**

Table 12: Profitability of Cherry Exports

ITEM	COST
Cost of Production	18,000
Handling/packing/ transport domestic	11,250
Handling/packing/ transport export	52,500
Sales export sales domestic	125,000 60,000
Profit	**103,250**

The margin profit will depend largely on yield and the portion of the crop that is exported. However, sweet cherry remains a very profitable crop, even for local market. A grower in the Azrou area sold 3 hectares of crop on the tree for 320,000 Dh or an average of 106,667 dh/ha. Even with a production cost of 18,000 Dh/ha, and even though harvest cost in this case is at the expense of the buyer, cherries gave this grower a return of more than 88,000 Dh/ha.

98

E. PLUM

1. Production costs and yield

Yield depends largely on the variety, soil and climatic conditions, cultural practices and management skills. An estimated budget for production (Table 13) and the estimate of potential returns which follow illustrate the overall profitability potential of prune plum production in Morocco.

Table 13. General budget for prune production in Morocco.

OPERATION	QUANTITY	UNIT PRICE Dh	TOTAL VALUE
Labor	80 days	35	2000
Fertilizers			1500
Machines			1000
Pesticides			2000
Irrigation	$4000m^3$		1600
Fixed costs			
Land Rent			3000
Amortization			2000
Finance costs			1300
Total Cost			**14,400**

2. General Costs and Returns:

The average production cost for prunes is 14,000 Dh/Ha.
The average yield is 15 T/Ha.
The production cost is approximately 1 Dh/Kg of fresh plum.
The drying cost is 1 Dh/kg.
The production cost and drying cost is: 14,000 + 15,000 = 29,000 Dh
The drying yield is 33%: 15 T x 0.33 = 5 T of prunes per Ha. The handling, sizing, packing, and shipping of prunes costs: 1 Dh/Kg or 5,000 x 1 Dh/kg =5,000 Dh.
The overall total cost is: 29,000 + 5,000 = 34,000 Dh/Ha production.
The sale price is: 5,000 Kg x 20 =100,000 Dh/ha.
The average returns for prune plums is:

100,000 - 34,000 = **66,000 dh/ha.**

There is a high demand for plants of prune plums as the acreage of prune plums has been increasing in recent years. This increase is due to market demands and the profitability of the crop. As a dried product, prunes offer the possibility of storage and strategic marketing. At this time, there is very little seasonal variation in the price of prunes.

Table 14: Profitability of Prune Production

ITEM	COST
Cost of Production	14,000
drying Prunes	15,000
Handling/packing/ transport	5,000
Sales Revenue	100,000
Profit	**66,000**

F. APRICOT

1. Establishment costs

A general budget illustrating establishment costs for apricot production is outlined in Table 15. The establishment costs will vary depending on the plant density, training system and type of irrigation.

Table 15: General budget for establishment costs for apricot production in Morocco (Dh/ha)

OPERATION	COST (DH)
Labor	4,000
Equipment	4,000
Fertilizers	3,000
Plants (400 x 10)	4,000
Finance Costs	5,000
Total	**20,000**

2. Production costs

Yield depends largeley on the variety, soil and climatic conditions, cultural practices and management skills. An estimated budget for production (Table 16) and the estimate of potential returns which follow illustrate the overall profitability of apricot production in Morocco.

100

Table 16. General budget for apricot production in Morocco.

OPERATION	QUANTITY	UNIT PRICE	TOTAL VALUE
	80	35	2,800
Labor			1,000
Fertilizers			1,000
Equipment			1,500
Pesticides			800
Irrigation	2,000 m3		
Fixed costs			
Land Rent			2,000
Amortization			1,000
Finance costs			1,000
Total			**11,000**

3. General costs and returns

The cost of production for apricots is 11,000 Dh/ha. The average yield of mature apricot orchard is 15 T/ha. The production cost is 0.73 Dh/kg.

Apricots are produced for both fresh and processing.

a. For early apricots used for fresh market only:

Handling and packing and shipping costs are 0.27 Dh/kg.
Total cost (production, handling and shipping is: 0.73 + 0.27 = 37,500 Dh
The total cost is 15,000 Dh.
The return from one hectare of apricots would be : 37,500 - 15,000 = 22,500 Dh.

Table 17: Profitability of Apricot Production for Fresh Market

ITEM	COST
Cost of Production	11,000
Handling/packing/ transport	4,050
Sales Revenue	37,500
Profit	**22,450**

b. Apricots for processing.

Handling cost is 0.07 Dh/kg.
Total cost is 0.73 + 0.7 = 0.80 Dh/kg.
The average sale price for processing is: 15,000 x 1.50 = 22,500 Dh.
The total cost is : 15,000 x 0.80 = 12,000 Dh
The return from one hectare of apricots would be : 22,500 - 12,000 = 10,500 Dh.

Table 18: Profitability of Apricot production for Processing

ITEM	COST
Cost of Production	11,000
Handling	1,050
Sales Revenue	22,500
Profit	**10,500**

G. GRAPES

1. Establishment cost

A general budget illustrating establishment costs for table grape production is outlined in Table 19. The establishment costs will vary depending upon the cultural management system used.

Table 19. General budget for establishment costs for table grape production in Morocco.

OPERATION	QUANTITY	UNIT PRICE (Dh)	COST
Land Preparation	100 days	35	1,500 3,500
Labor			6,000
Fertilizers	2,666	10	26,600
Plants			
Trellis	500	15	7,500
Posts	700 kg	7	4,900
Wire			40,000
Irrigation System			8,000
Finance costs			
TOTAL			**98,000**

102

2. Production costs and yield

The production costs of table grapes in the first year of production are shown in Table 20, while second and third year costs are listed in Table 16.

Table 20. Production cost for the first year of table grape production in Morocco.

OPERATION	QUANTITY	UNIT PRICE	TOTAL COST
Soil			1,000
Management	15 days	35	525
Pruning			1,500
Fertilizers	2000 m^3	0.4	800
Irrigation			1,500
Pest control			2,000
Land rental			675
Finance cost			
TOTAL			**8,000**

Table 21. Production cost for the second and third year of table grape production in Morocco.

OPERATION	QUANTITY	UNIT PRICE	TOTAL COST
Soil			1,000
Management	20 days	35	700
Pruning			2,000
Fertilizers	3000 m^3	0.4	1,200
Irrigation			2,000
Pest control			2,000
Land rental			900
Finance cost			
TOTAL			**9,800**

Despite the fact that grapes produce a crop starting in the second year, we will assume that the grower will harvest sizeable yields beginning in the fourth year.

The establishment cost is equal to: Actual establishment cost plus the first two years: 98,000 + 8,000 + 10,000 = 116,000 Dh/ha to be recovered over 25 years.

103

Table 22. The total cost of producing one hectare of table grapes in Morocco.

OPERATION	QUANTITY	UNIT PRICE	COST
Soil management			1,500
Labor	120 days	35	4,200
Fertilizers			3,000
Irrigation	4,000m^3	0.4	1,600
Pest control			3,000
Land rental			2,000
Amortization			8,000
Finance cost			2,700
TOTAL			26,000

The average yield of table grape is 25 T/ha
The average production cost is 1.04 Dh/kg.
The average price is 4 Dh/kg

The wholesale price is 25,000 Kg/ha x 4 Dh/kg = 100,000 Dh/ha
The return on investment for one hectare of table grapes is approximately:
100,000 - 26,000 = 74,000 Dh/ha, farm gate

Table 23: Profitability of Grape Production

ITEM	COST
Cost of Production	26,000
Handling/packing/ transport	4,000
Domestic Sales	100,000
Profit	**70,000**

H. MELON

1. Establishment costs

A general budget illustrating establishment costs for greenhouse melon production is outlined in Table 24. The establishment costs will vary depending on the type of cultural management used.

Table 24. Establishment cost of one hectare of melons under plastic house.

OPERATION	AMORTIZATION PERIOD	ANNUAL COST
Irrigation Equipment (2 Ha)		
Well & Storage	20 years	1,500
Pump and motor	10 years	2,500
Head Station	10 years	2,500
Irrigation Material	4 years	5,000
Plastic House (1 Ha)		
Support (24,000 kg x 10 Dh)	10 years	24,000
Plastic film (4,000 Kg x 18	2 years	36,000
Dh)	2 years	4,000
Wire (1,000 kg x 8 Dh)		
Other	2 years	1,500
Rope for trellis (100kg x		2,000
30Dh)		2,000
Labor		
Soil preparation		9,000
Finance costs		
TOTAL		**90,000**

2. Production costs and yield: greenhouse melons

Yield depends largely on the variety, soil and climatic conditions, cultural practices and management skills. An estimated budget for production (Table 25) and the estimate of potential returns which follow illustrate the overall profitability potential of greenhouse melon production in Morocco.

Table 25. Production costs per hectare for greenhouse melons in Morocco.

OPERATION	COST
Labor	35,000
Plants	20,000
Fertilizers	15,000
Irrigation	4,000
Pesticides	5,000
Land rental	3,000
Finance cost	8,000
TOTAL	**90,000**

3. **General Costs and Returns for greenhouse melons:**

The total production cost is 180,000 Dh/Ha.
The yield of a intensive melon culture is about 60 T/ha.
The production cost is then 3.0 Dh/Kg of melon.

The Handling and packing cost of melon for export is 1.80 Dh/Kg.
The transportation cost for export by frigo truck is 1.70 Dh/Kg.
The handling, packing and shipping costs is 3.50 Dh/kg.

Assume a grower can export 35 T of production at an average price of 12 Dh/kg.
The wholesale exporting price is:
35,000 kg x 11 Dh/Kg = 385,000 Dh/Ha.
The overall cost of the exported portion is:
35,000 Kg x (3 + 3.50) = 227,500 Dh.

The remaining crop is sold on the local market, where the average wholesale price is 4 Dh/Kg.
The wholesale price of the locally sold crop is:
25,000 Kg x 4 Dh/Kg = 100,000 Dh.
The handling, packing, and transportation for melon sold on the cost local market is 0.5 Dh/kg.
The cost for the portion sold on the local market is:
3.5 x 25,000 kg = 87,500 Dh
The wholesale price local and export is:
385,000 + 100,000 = 485,000 Dh/Ha.
The whole cost (production + handling + shipping) is:
227,500 + 87,500 = 315,000 Dh/Ha
The return from one hectare of greenhouse melons is:
485,000 - 315,000 = 170,000 Dh/Ha.

Table 26: Profitability of Greenhouse Melon Production

ITEM	COST
Cost of Production	227,500
Handling/packing/ transport	87,500
Domestic Sales Export Sales	385,000 100,000
Profit	**170,000**

106

4. Costs of establishment and production for tunnel melons

Table 27. Production costs per hectare for melons grown under small tunnel ("tunnel nantais") in Morocco.

OPERATION	QUANTITY	UNIT PRICE	GLOBAL COST	ANNUAL COST
Metal Support	6,000 m	1.2	7,200	1,500
Plastic -Mulch	360	12.5	4,500	4,500
Plastic -Tunnel	1,000	18	18,000	9,000
Irrigation			20,000	10,000
Plants	15,000	1	15,000	15,000
Cultural costs			20,000	20,000
Finance costs				5,000
TOTAL				**65,000**

5. General Costs and Returns:

The average production cost for melons under small tunnels is 65,000 Dh/ha.
The average yield is 40,000 T/Ha.
The cost of production is 1.625 Dh/kg
Assume grower will sell T/H for export
The handling and packing cost is 1.80 Dh/Kg
The transport cost is 1.70 Dh/Kg
The total cost (production + handling + packing + shipping) is 5.125 Dh/Kg.
The total cost of exported production is:
25,000 Kg x 5.125 Dh/Kg = 128,125 Dh.
The average export price is 10 Dh/Kg
The wholesale export price is 25,000 kg x 10 Dh/Kg = 250,000 Dh

Assume that the remaining portion of the crop (15 T) is sold on the local market
The average price on the local market is 4 Dh/Kg
The wholesale price on local market is 15,000 Kg x 3.5 Dh/Kg = 52,500 Dh
The handling and shipping cost is 1 Dh/Kg.

The total cost of the portion sold on local market is
15,000 kg x (1.625 + 1) Dh/kg = 39,375 Dh
The total cost is 128,125 + 39,375 = 167,500 Dh
The wholesale price (export & local) 250,000 + 52,500 = 302,500 Dh
The return from 1 ha of small tunnel melons is 302,500 - 167,500 = 135,000 Dh.

Table 28: Profitability of Tunnel Produced Melons

ITEM	COST
Cost of Production	65,000
Handling/packing/ transport domestic	15,000
Handling/packing/ transport export	87,500
Domestic Sales	52,500
Export Sales	250,000
Profit	**135,000**

I. STRAWBERRY

1. Preharvest and postharvest costs

Preharvest seasonal production costs can be as high as $20,000 US per hectare in addition to developing infrastructure and equipment. In the major production area north of Kenitra, and osts approximatel $22 000 US per hectare, while land rental averages between $275-330 US P at costs from most nurseries are in the range of $ 0.11-0. 4 US per plant, this a grower would invest approximately $9,000 per hectare in plants for a typical two row system and up to $15,000 US for the four row system. Plants can cost as little as $0.09 from some Spanish nurseries.

The cost of plastic greenhouse tunnels is approximately $2,000-3,000 US per hectare depending on size and materials. Drip irrigation costs run between $2,000-2,500 US. Fertilizer and pesticide costs vary on cultural practices but likely average $800-1,000 US per hectare. Labor costs will vary greatly upon cultural practices but, in general, agricultural labor costs $3.50-4.00 US per day. For example, some growers with very vegetative plants will remove leaves on a regular basis, thus adding to labor costs An approximate range for labor costs for field and harvest labor per hectare is probably $4,500-5,000 US.

Independent of long term fixed costs, a rough budget for seasonal production of one hypothetical hectare of 'Chandler' strawberries north of Kenitra in the two row, raised bed system with 70,000 plants/ha with black plastic mulch and plastic tunnels would be similar to table 29 below:

108

Table 29: Establishment Costs for one hectare of Strawberries

OPERATION	TOTAL VALUE
Land Rental	300
Plants	8,400
Drip Irrigation	2,300
Plastic tunnels	2,500
Fertilizers and Pesticides	900
Labor	4,600
Miscellaneous	1,000
Total Cost/ha	**$[illegible]0,000**

It is difficult to establish average returns as yields vary as per time of season and what portion of the crop is sold for fresh export, frozen export or fresh local market. The length of the harvest season into the summer also dictates to some degree the amount of activity in the latter two categories. Earlier growers who can market more of their crop in February when prices in Europe are still high will recoup their expenses faster, while additional profitability will come from frozen and local fresh market sales. Costs for holding, packaging and transporting to point of departure range from $0.35-0.45 US per kilo. However, an average sales price of 7.5 ff/kg (approximately $1.50/kg) on a yield of 50 Tons/ha for export, would give the following results.

Table 30: Approximate Profitability of Fresh Strawberry Production in Morocco (50 tons export)

OPERATION	TOTAL VALUE
Production/harvest Costs	$20,000
Handling/Packing/Shipping	$20,000
Sales Revenue	$75,000
Profitability	**$35,000**

ANNEX FOUR

VARIETAL DESCRIPTIONS OF FRESH FRUITS AND SOME PRODUCTION ISSUES

PEACHES AND NECTARINES

Chilling Requirements

Chilling requirements are expressed in number of hours of chilling or in chilling units. The latter is the maximum amount of chilling that can be satisfied in one hour at an optimum temperature. The base temperature for the calculation of chilling hours is 7.2C. However, it has been established in experiments dealing with seeds and potted trees that low chilling peaches respond to a wider temperature range. It is believed that the optimum temperature for most low chill peaches and nectarines is closer to 13C. Most of these cultivars have fruited well where the coldest month averages 14 to 17C and also in colder locations. In some cases, these varieties will set and mature a full crop after fewer (50%) than the "required" chilling hours listed in the description, but flowering and foliation will be delayed from 5 to 10 days.

Low Chill Peach Varieties

Flordaprince. 150 hours. Semi-cling peach with 90% red surface color over a yellow background color. High color and good firmness make it a good shipping variety. It is an early ripening variety (80 days after bloom) in early to mid April under Moroccan conditions. Produces good quality fruit with an average weight of 90g.

Flordabelle. 150 hours. Fairly large and round freestone fruit with 60% red surface color. It is one of the largest peaches in the early season market, and fruit size is good even when heavily cropped. The trees have produced up to 50 kg per tree, 95% of which are greater than 6 cm in diameter and with an average weight of 120 g. this variety ripens 100 days after bloom.

Earligrande. 200 to 250 hours. Large fruit with 80% red blush over a yellow\green background color. This variety crops heavily and is similar in color to Desertgold but has greater size and better shipping qualities.

Desertgold. 300 hours. Clingstone peach with 70% red surface color over a yellow\green back ground color. It has a round medium-sized fruit smaller than Earligrande and Flordaprince.

Flordagold. 300 hours. Yellow, semi-cling peach with 60% red blush over a bright yellow ground color, making the fruit very attractive. Flordagold is highly productive, but it sets many flower buds and may require heavy thinning some years. Double fruits may be a problem in some years, as the rate of doubling has been as high 30%. This problem could be solved by thinning. It may ripen in the end of April to early May in Morocco depending on the location.

San Pedro. 300 hours. Medium-sized, semi-cling, firm yellow peach with about 50% red blush.

Flordaking. 450 hours. Fruit with 50% red surface color over greenish background. this variety could be used as an indicator of chilling hours as it develops a pointed tip under 400 hours, and the tip will become more pronounced as the chilling hours are lowered. It is a heavy producer that requires considerable thinning when most flowers set fruit. Good fruit size, relatively low sugar content, and susceptible to pit splitting. Ripens in mid-April to early May.

RioGrande. 450 hours. Medium to large freestone type with firm fruit and a 75% red blush over a yellow background color. This variety may ripen in late May in Morocco.

FlordaGrande. 100 hours. Very low chilling requirement and is a medium-early producer of high yields of high quality fruit. Fruit ripens in early to mid-May in Texas and Florida. It can be an excellent choice for planting with EarliGrande and Flordaprince which ripen in mid- to late April. Flowers appear to be more frost tolerant than other cultivars with similar bloom dates (i.e. Flordabelle and Flordared). This variety will produce 60 kg of fruit per tree in its fourth season 93% of which are greater than 110 with a season average of 6.4 cm in diameter and over 113 g in weight. Fruit ripen approximately 100 days after bloom. It is a freestone, yellow flesh peach with 50% to 70% red color. The fruit is resistant to browning on cut surfaces, has a medium firm and smooth texture and is of medium-high quality. Trees are semi-erect, producing strong vigorous growth, and are tolerant to bacterial spot (*Xanthomonas campestris pv. pruni* [Smith]).

TropicSweet. 175 hours. High yielding, high quality medium-early freestone cultivar. It is one of the earliest-ripening, freestone subtropical peach varieties. It ripens in late April to early May (in South Texas), between the mid-April harvest of the semi-cling cultivars EarliGrande and Flordaprince, and before the mid-May harvest of FlordaGrande. Open flowers of this variety are more frost-tolerant than most cultivars that bloom in early February. Flower bud-set is high and fruit thinning at about 15 to 20 cm apart is necessary to obtain 6 to 8 cm diameter fruit. Average bloom dates are late January to early February. Fruit are large, averaging 110 g in weight and 6.4 cm in diameter. Fruit ripen about 90 to 100 days after bloom. Fruit are of high quality for its season of maturity. It is normally the first fully freestone peach to ripen in most seasons. Fruit are round and firm with a slightly dull red color covering 75% of the fruit. The ground color is yellow. Flesh is dark-yellow to pale orange and resistant to browning on cut surfaces.

TropicBeauty. 150 hours. High-yielding, high-quality medium-early semi-freestone peach cultivar well adapted to subtropical climates. It ripens by mid-April, about 90 days after bloom. Flower bud-set is high requiring fruit thinning to 15 to 20 cm to obtain 6-8 cm diameter fruit. Bloom period is late January to early February. Fruit are large for its date of maturity, averaging 100 g in weight and 6 cm in diameter. It is a very attractive cultivar as its external color is 80% red over a very strong yellow ground color. Flesh

resistant to browning on cut surfaces.

ttractive, yellow fleshed fruit ripening before Flordaking. It
as produced good crops where the coldest month averaged 14
ons in the absence of spring frosts. Fruit ripen 60 days after
rage 5 cm in diameter and 90 g in weight. External color is
attractive yellow ground color. Flesh is yellow,
aracter, and is classified as semi-cling.

Semi-cling peach with a higher percentage of red surface color,
r incidence of split pit than Flordaking. It ripens several days
lobe has fruited well where the coldest month averages 12 to
in the absence of spring frosts. The fruit ripen 65 days after
aking) in late April. Fruit size is 5.2 cm in diameter and 90 g
n be obtained with heavy thinning (one fruit per 15 to 20 cm
excellent with an 80% red blush over yellow ground color.
ing in character and relatively nonbrowning.

-fleshed peach cultivar with good quality fruit ripening mid-

igh yielding, high quality, medium-early white-fleshed
by mid-May in Texas. It is a good choice to plant with
TropicSweet, and FlordaGrande, with which it ripens in most
high requiring thinning at about 15 to 20 cm apart to obtain 6-
are large and of high quality, averaging 110 g and 6.4 cm in
to 100 days after bloom. It is the first freestone white-fleshed
n. External color is 25% to 50% red over a creamy white
ite and highly resistant to browning on cut surfaces.
al quality, white fleshed peach for subtropical climates. Tree
fruit quality have all been high in both Texas and Florida.

ties

d quality nectarine of small to medium size with a 100% red
by late April to early May in Morocco.

ood quality variety. Large, round, fully colored fruit that may
f May in Morocco.

early February in California and ripens early May. Excellent
% red color over a yellow background.

mid-February in California and ripens mid-May. Good quality
5-14. The fruit is yellow with a 50% red blush on their

112

Sunfire. 500 hours. Round fruit with a yellow background color and bright exter color covering 75% of the surface. Fruit flesh is yellow, firm, of smooth texture a good quality. Highly productive, this cultivar may ripen mid to late May in Moroc

Sunlite. 450 hours. Fruit with an appealling yellow color and a 50% red blush ov surface. May ripen in late May to early June in Morocco.

Sunripe. 350 hours. Medium to large high quality, yellow flesh, freestone, nectar The skin has a yellow ground color with about 80% bright red overcolor at harvest. ripen just after Sunlite.

Sunhome. 300 hours. Blooms in early to mid-February, or about 3 to 5 days after Sunred. Trees are vigorous and highly productive, requiring fruit thinning to 15 to apart for proper sizing. The fruit ripen about 85 days after bloom and average 5 cn diameter and 80 g in weight. The fruit is about 10 to 20% larger than Sunred. The is yellow, of firm, smooth texture, freestone and of medium quality. The flesh is relatively nonbrowning following cuts and bruises. The fruit has a 100% red blush bloom through maturity.

Sungem. 450 hours or about the same as Sunlite nectarine and Rio Grande peach. has fruited well where the coldest month averages 12 to 14C. Full bloom occurs mi late February. Sungem has shown good commercial potential in Spain, Chile, Austr and probably also in Morocco. Fruit are medium in size averaging 5 cm in diamete 80 g in weight when thinned 15 to 20 cm apart. Fruit ripen 70 days after bloom or days before Arking nectarine. Fruit are semi-cling, flesh is melting, yellow, and fir with good quality and relatively nonbrowning cut surfaces and bruises. Pits have litt tendency to split, except when crop size is light or when trees are girdled. Attractiv fruit with 90 to 100% red blush over a yellow ground color with little russeting com to Sunred. Harvest periods last 5 to 7 days beginning early to mid-May and are usu after Flordking peach but before Armking nectarine. High degree of fruit set and ea ripening are the major advantages of Sungem nectarine.

Sundollar. 400 hours. Attractive red fruit with yellow flesh. It blooms at the same as Flordaking. Sundollar trees have fruited well where the coldest month averages 1 16C and in the colder locations in the absence of spring frosts. Fruit ripen 70 days a bloom, 5 to 7 days before Sungem. Fruit size is 5.1 cm in diameter and 80 g in wei when thinned to one fruit per 10 cm shoot length or 5.2 cm (90 g) when thinned to fruit per 20 cm shoot length. Fruit of Sundollar are larger than Sungem when thinne equally. External appearance is attractive, with 80% red blush over a yellow ground color. It is a semi-cling nectarine with yellow melting flesh. Trees must be irrigated regularly during rapid periods of fruit growth to minimize longitudinal fruit cracking years of intermittent drought. Fruit cracking has been reduced to less than 5% with irrigation. Sundollar fruit has shown little tendency to for split pits (<5%) compare Sungem (30 to 50%).

Sunblaze. 250 hours. High quality, yellow-flesh fruit with rich, red skin pigmentati Sunblaze is expected to replace Sunred because it blooms and ripens with Sunred but

bears larger and more attractive fruit with less russeting. Full bloom occurs in early to mid-February and trees have fruited well where the coldest month averages 15 to 17C and in colder locations in the absence of spring frost. Major advantages of Sunblaze are increased fruit firmness and size over Sunred and resistance to bacterial spot. Fruit are moderately large, averaging 6 cm in diameter and 100 g in weight. Fruit thinning to 15 to 20 cm apart is required for proper sizing. Fruit ripen 90 days after bloom at the same time as Sunred and 10 days after Flordaprince peach. Flesh is yellow and melting with good dessert quality and flavor. Flesh browning does not occur readily on cut or bruised surfaces. Pits are medium small and have low tendency to split during fruit development. External fruit appearance is similar to Sunlite nectarine, with 90% to 100% deep red blush over a yellow ground color. The harvest period, lasting 5 to 7 days, begins by mid-May.

Planting system

Until recently peaches in Morocco were grown at 6 x 4 m (416 trees per ha) on a vigorous rootstock (seedling) and trained to be free standing with an open center. Recently growers are opting for higher densities to make better use of land and water resources and to respond to changing markets. Most recent plantings are densities of between 1000 to 1250 trees per hectare, are free standing or trellised.

APPLES

The most interesting early season varieties currently grown include:

Anna. A low chill apple variety (300 hours) which has been tested in the United States since 1967 with excellent results. The fruit ripens in mid-June in Marrakech and produces medium-sized fruit with about 30 to 50% red blush on a yellow background with excellent flavor and good quality.

Ein Shemer. A low chilling apple variety (400 hours) originally selected as a pollenizer for Anna and was used in Israel and the United States in a ratio of 1 to 4. However, under Moroccan conditions, the blooming dates of the two varieties do not overlap very well. The fruit is medium in size and the final size depends largely on the degree of thinning. The ground color is yellow with red stripes on the surface with good quality and flavor. It ripens about the same time as Anna. Ein Shemer is less prolific in bearing and growth habit.

Dorsett Golden. A low chill variety (250 hours) which originated from a chance seedling in Bahamas. It is an excellent yellow apple variety of good quality and tart flavor. It is used as a pollenizer for Anna. Trees are highly precocious and begin flowering in the field the second year, even on seedling rootstock. It ripens by mid-May to early June depending on location. Anna and Dorsett Golden are apparently not as dependent on chilling as peaches in that they will fruit satisfactorily with 200 hours or even slightly fewer. However, when chilling is less than 300 hours, time of bloom and ripening will be delayed. Five year old trees can easily yield 40 kilos of fruit.

Growers in higher altitudes have been looking for varieties with good quality and storage characteristics. The objective is to diversify and find varieties other than standard red and yellow Golden Delicious and its mutants. Examples of varieties such as these include:

Red Miracle: Good apple with attractive red color beginning at early stage of fruit development. this variety may have a russeting problem in certain years.

Mutsu: A good variety with large fruit.

The need for a red apple variety which stores well is growing and is due to the fact that red American apple varieties become powdery if stored for a long time. Two varieties seem to have potential to fill the need for longer storage life:

Fuji (Ralls Janett x Red Delicious): This variety can be stored as long as the following June. It would likely be profitable to have a good red apple on the market at that time of the year.

Braeburn: This variety was a chance seedling from New Zealand and many red mutants have been developed from the original cultivar. The most important mutant is ***Hidala Hillwell Braeburn*** which has excellent taste, firm flesh and a long life storage.

Rootstocks and Planting systems

The primary rootstocks used by the Moroccan apple industry include : seedling, MM111, MM106, M7, M9, Pajam 1 & Pajam 2. Among these rootstocks, MM106 is by far the most widely used in Morocco. MM106 is an excellent semi-dwarf rootstock with an excellent ability to adapt to a wide variety of soils but is also very susceptible to *Phytophthora*. In heavier, wet soils where this disease may be a problem, growers use a less susceptible rootstock of similar vigor such as M7. The dwarf rootstocks M9 or Pajam series require a trellis and are used for higher density plantings.

Planting densities vary from 1000 trees per hectare (5 x 2 m spacing) to 1481 trees per hectare (4.5 x 1.5 m spacing) and in some cases reach as high as 2850 trees per hectare.

PEAR

Most of Moroccan pear production is confined to high elevations and the dominant training system is central leader with an average density planting of 1667 trees per hectare (4 x 1.5 m spacing). Production costs are similar to that of apple and are approximately $3,300 US per hectare. Average yield is approximately 30 tons per hectare, thus production cost per kilo of fruit is approximately $0.11 US.

Flordahome. Highly and consistently productive and may require thinning. Fruit is round-ovate, about 6 cm in diameter, and may mature in mid to late July in Morocco. It is harvested at hand green stage and ripens 5 to 10 days at 18 to 20C. The flesh is white,

115

juicy and fine-textured. The fruit can be used for fresh consumption and canning. The variety requires pollination from Hood or Pineapple varieties.

Hood. This variety serves as pollinator for Flordahome as it blooms at the same time. The fruit has a melting texture. Tree could be very large when mature if not properly trained and a dwarf rootstock is not used.

Pineapple. This variety also serves as a pollinator for Forldahome. Trees are vigorous and very productive with large, heavily russeted fruit. The flesh has a slight taste of pineapple.

Rootstocks

Seedling rootstocks are very vigorous used only under certain conditions. In particular in situations where it gives better resistance to calcareous soils, in conditions where Quince (cognassier) can not be used and with cultivars which have graft compatibility . The latter is the case with compound trees of Quince with Beurre Bosc, Docteur Jules Guyot and Packham's Triumph. The most widely used type of rootstock for pear in Morocco is Cognassier de Provence which allows better control of tree vigor. BA 29 is a French selection of Cognassier de Provence and is by far the most widely used rootstock in Morocco.

SWEET CHERRY

Low chilling, early season varieties

There is a need for low chilling varieties in order to expand the area of sweet cherry production to lower elevations and obtain early production for potential export markets.

Two varieties which should be tested in Morocco are promising because of their earliness, quality and reduced chilling requirements.

Precoce Bernard. This French variety, a chance seedling, ripens 5 to 10 days before Burlat, probably due to a lower chilling requirement. Trees crop heavily with good fruit size (7 to 8 g) which are similar to Burlat in firmness. Harvest can be prolonged as fruit ripening can be uneven throughout the crop, and the fruit are susceptible to splitting which could be of concern, particularly in areas with a wet growing season.

Marvin^{R}Niram . This variety, obtained from California, ripens 5 to 7 days before Burlat. Fruit size is 7 to 9 g with good fruit firmness superior to that of Burlat. This is probably a good variety for early cherry production in lower elevations.

Two other varieties which have been tried in Morocco are reported to ripen before Burlat under Moroccan conditions as opposed to their location of origin where they ripen later than Burlat.

Stella. Obtained from Summerland, British Columbia, Canada. It is a self-fruitful variety that could be used as a universal pollenizer. It was reported that Stella ripens fruit in Meknes 7 to 10 days before Burlat, while in France it ripens 15 days later. Stella and Precoce Bernard appear to have a short fruiting cycle (days between full bloom and ripening), probably due to either their relatively low chilling requirements and/or their low temperature threshold for growth. Fruit size is about 8 g with a good firmness.

Sunburst. Obtained from Summerland, British Columbia, Canada. This variety is a hybrid of Van x Stella with good size (10 to 13 g) and good quality fruit. According to a grower in Meknes, this variety ripens 7 days before Burlat, while in France it is reported to mature at the same time as Van, approximately 18 days after Burlat.

These varieties may all be earlier than Burlat and offer a limited possibility of expanding the harvesting period for cherries in Morocco, but do not really show good promise for extending the area of culture to lower elevations. All of these varieties have a chilling requirement higher than 500 hours and therefore can only be grown in locations where they can get enough chilling to produce a commercial crop of quality fruit (See map). The need for varieties requiring fewer chilling hours is great, and every effort should be made to find and import any new varieties which meet this need.

The most widely used rootstock in Morocco and the Mediterranean region is *Prunus mahaleb* (Sainte Lucie seedling or SL 64), which is 20% less vigorous than Merisier thus produces an earlier crop and a smaller tree for higher density planting of 300 to 350 trees per hectare.

In order to use limiting and expensive resources such as land an water more efficiently, reduce labor costs and respond more effectively to the demands of a changing market, the fruit industry needs to move towards higher density plantings. High density plantings require the use of semi-dwarf or dwarf rootstocks. Two rootstocks which could have significant potential for this industry and should be evaluated under Moroccan conditions include:

Maxma^R Delbard 14. This rootstock is a hybrid between *Prunus avium* and *Prunus mahaleb* semi dwarf rootstocks and is 40% less vigorous than its *Prunus avium* parent. It is well adapted to a wide variety of soils and induces early cropping. With this rootstock, tree density can be increased to 420 trees per hectare.

Tabel^R Edabriz. This clone of *Prunus cerasus* is a dwarf rootstock which is 70% less vigorous than *Prunus avium* and allows the use of 800 trees per hectare. It induces early cropping. This rootstock may show symptoms of iron deficiency in calcareous soil or alkaline pH. This higher density has the potential to greatly increase production efficiency and to reduce production costs, especially labor for harvest.

Rootstocks

Traditionally, most cherry varieties grown in Morocco have been grafted on wild cherry. Merisier du semis (*Prunus avium*) is a very vigorous rootstock which produces large trees

and late cropping. These larger trees allows only low density planting of 200 to 250 trees per hectare and results in difficulties and excessive labor costs in training, pruning and harvesting.

The most widely used rootstock in Morocco and the Mediterranean region is *Prunus mahaleb* (Sainte Lucie seedling or SL 64), which is 20% less vigorous than Merisier thus produces an earlier crop and a smaller tree for higher density planting of 300 to 350 trees per hectare.

In order to use limiting and expensive resources such as land an water more efficiently, reduce labor costs and respond more effectively to the demands of a changing market, the fruit industry needs to move towards higher density plantings. High density plantings require the use of semi-dwarf or dwarf rootstocks. Two rootstocks which could have significant potential for this industry and should be evaluated under Moroccan conditions include: **Maxma[R] Delbard 14** and the **Tabel[R] Edabriz**.

PLUM

The most important Japanese plum (*Prunus salicina*) varieties grown in Morocco are **Santa Rosa**, **Methley** and **Golden Japan**. Japanese plum varieties differ considerably in size, shape, skin color, flesh color, texture, and season of ripening. In addition to these older Japanese plum varieties, two newer have been introduced and produced commercially. **Blackamber**, a large black plum, has gained rapid consumer acceptance. The fruit has a flat shape, black skin and white flesh which ripens in mid-June in Morocco. **Angeleno** is a late plum variety with flat shaped fruit, black skin and ripens in early September.

Early varieties which may be of interest for Moroccan growers include **Red Beaut** and **Spring Beaut** which may ripen in Morocco in early to mid May. **Red Beaut** (450 hours) has red skin and yellow flesh but may be difficult to pollinate.

European Plums

The most important European (*Prunus domestica*) plum variety in Morocco is **Stanley**. This is an excellent variety which well adapted to Moroccan climates. Consistently productive, this variety is self-fruitful, with large fruit (30 to 40 g), good flesh firmness, dark red purple skin, yellow flesh, good quality and high soluble solids content. Its high soluble solids, firmness and physical resistance to handling and transportation make the fruit suitable for fresh eating and drying. Trees bear a heavy crop which may require thinning. It may produce a large number of double fruit in certain years, a problem which can be solved by thinning. Fruit ripen at the end of August to early September and the harvest season lasts approximately 15 days. The acreage of this variety has significantly increased in the last few years because of the flexibility offered by its use as a dried product. Drying yield is high about 30% which offers a use with extended storage and marketing opportunities. Stanley is used mainly for prune production as it can be dried whole without fermentation at the pit and is characterized by a high sugar content.

management. While some of the best growers will continue to successfully grow and export 'Chandler' for the foreseeable future, there will likely be a decrease in the production of 'Chandler' over the next few years.

'Oso Grande'. 'Oso Grande' is the other major variety in Moroccan production and may account for as much as 25% of current production. Some growers who are expanding plantings seem to be favoring 'Oso Grande' over 'Chandler', and some will be planting 'Oso' much more heavily next year. It is considered to be a high yielding variety which is earlier than 'Chandler' with very large fruit and excellent fruit quality. It is a variety which ships very well. Growers describe "Oso Grande' as a large fruited variety which maintains it size well, has fewer problems in exporting, is easier to handle and yields heaviest earlier when prices are higher. Potential problems with 'Oso Grande' noted in California (albinism and split fruit) may also be found in Morocco as some fruit with color problems and hollow centers were observed.

Other Cultivars

Other varieties in Morocco probably don't account for more than 15% of planted surface area.

'Senga Sengana'' is a standard variety in Europe, and is being produced for one exporter who ships only to the middle East.

'Tudela' is a Spanish variety being tried by some growers, but several indicated it did not look good for Morocco. One grower said that one of its parents is 'Chandler' and that it is "hard like a radish".

'Selva' a University of California day neutral variety has been tried, and while some plantings still exist, it is reported to have poor fruit quality during cooler weather

'Douglas', 'Parker' and *'Pajaro'* are University of California short day cultivars which have been tried in Morocco. They are productive and the latter two are good for shipping, but all are susceptible to weather problems and with other limitations will probably not claim significant surface area in Morocco.

One grower had tried the recent University of California release *'Seascape'* and reported that it had good color and flavor. It started producing in mid-January after a mid-October planting. It tended to fruit very heavily and then stop. This type of production behavior could be valuable if most of a cultivar's fruit was produced during periods when prices are high.

A number of other varieties from around the world have been or are currently being tried by various growers. Additional University of California varieties which should be tested include day neutral varieties such as *'Irvine'* and *'Muir'*. *'Irvine'* ships well, has smaller fruit than 'Oso Grande' but is somewhat similar in other respects. It is also earlier and has a lower temperature threshold for growth. A sibling of *'Selva'*, *'Muir'* also ships well, has better flavor but varies more in size throughout the season.

Variety Procurement and Testing

In general, larger producers would prefer to keep variety procurement and testing at the private level. Their concerns over institutionalizing the process include the amount of time it will take, the resources they already have invested in their own research and development as well as the potential results of having promising varieties widely planted across the industry and killing potential market niches. They also understood the risks inherent with having an "open door" policy for horticultural crop germplasm and the threat that this can pose to an industry. Smaller producers also do their own variety trials in order to identify varieties adapted to their area, but seemed more willing to cooperate with a public agency who would collect, preserve, maintain and evaluate germplasm.

ANNEX FIVE

STRAWBERRY PRODUCTION IN MOROCCO

BACKGROUND

The Moroccan strawberry industry has recently undergone rapid expansion with the development of export markets for fresh and frozen product, as well as increased demand at the local level. During the 1992\93 campaign, strawberry exports had the strongest growth rate in volume of any other crop in Morocco. Producing hectares of strawberries in Morocco have doubled in the last two seasons, and many new producers are beginning operations, while existing growers are either expanding current plantings or seriously considering doing so.

While a few producers emphasize strawberry as a primary crop, many are diversified agricultural organizations which are seeking new opportunities and/or are responding to client requests for strawberries as part of their product line.

Much of the production technology for this industry is being introduced from Spain or the United States and has yet to be fully adapted to the production regions of Morocco.

PRODUCERS

The majority of Morocco's strawberry production is done within organizations where the grower is vertically integrated and is also the exporter. A primary determinant of who can produce strawberries for export is the amount of product required to consistently fill trucks to Europe. The general opinion is that it takes a base of approximately 20-30 hectares of production to supply this need.

Strawberry producers in Morocco can be broken down into three general groups:

- Moroccan growers with limited plantings growing primarily for local markets, some of whom can sell part of their product for export.
- Moroccan growers partnered with French or Spanish companies who produce primarily for fresh and frozen export.
- Spanish or French companies producing strawberries in Morocco.

Foreign producers have moved here in search of a good climate, available land and reduced labor costs. With regard to climate, one highly experienced Spanish grower said that, compared to Spain, Morocco has a superior climate for strawberry production. With land rental costs at $275-330 US per hectare, land is relatively available and inexpensive. Agricultural labor costs in Morocco ($3.50-4.00 US\day) are less than 10% of similar labor in Spain.

MARKETS

Europe

Morocco's market is currently centered in Europe. The EEC is well-supplied by its own strawberry industries and only imports 10% of demand from non-EEC countries. Before the 1993\94 season, Morocco supplied only 10% of that demand with Poland (71%) and the United States (19%) accounting for most of non-EEC imports. In 1991\92, Germany and France accounted for nearly 75% of EEC strawberry imports. More than half of Moroccan strawberry exports go to France.

In 1993, 3,000 T of frozen Moroccan strawberries were sold in Europe in February and March as frozen stocks became limited. The favorable market for frozen strawberries in Europe was in large part due to a reduction in production in Poland, a leading supplier of frozen product for the European market.

Strawberry prices are highest in Europe from October through February. As production peaks for the spring and summer months, prices drop dramatically with Polish exports dominating the summer market at low prices. Morocco is currently well-positioned to take advantage of higher prices in January and February. Prices are at $5.33 US per kilo in January\February, $3.56 US per kilo in March and $1.78 per kilo US in April. As production technologies are improved and better adapted for Morocco, earlier production windows will be developed.

Other Markets

Few examples exist of Moroccan strawberries being exported outside of Europe. One exporter who specializes in exports to the Middle East is able to ship the French variety 'Senga Sengana' to Saudi Arabia. Buyers there are more concerned with large size and appearance than with taste.

Market Competition and Quality

When asked about fruit quality, most strawberry exporters admit that the only thing which will set their fruit apart from Spain or other competitors in the early market is quality. One producer is making quality the first priority and has constantly told their production people "Don't tell us about yield, tell us about quality".

The difficulty comes in Europe where some producers say that there is no brand or label recognition with buyers, just labels like "Spanish quality" and "Moroccan quality". With all Moroccan strawberries being seen as the same product in Europe, it lends credence to what several producers said about market competition: "Morocco's biggest competitor is Morocco".

Moroccan Local Fresh Market

Within Morocco, demand for fresh strawberries will probably continue to expand. Currently, as prices lower in Europe and warmer temperatures reduce shipping quality, most of the crop goes for local market. While most June field packs for fresh market look quite similar with a fairly wide range of fruit maturity and quality, better packs are diverted to the more upscale Moroccan markets. As an example, one Spanish grower who has the

122

reputation for growing the highest quality strawberries in Morocco, does have name recognition for his product, and buyers actively seek his fruit.

An interesting observation about the local market made by one long-time observer of the Moroccan strawberry industry had to do with the timing of Ramadan. During this time people fast during the day and eat well at night. With a strong focus on food, people tend to buy more specialty foods such as strawberry. His observation was that as Ramadan shifts 10 days earlier each year and now preceded the heavier production periods that local consumption had decreased. He claimed that the local market would strengthen again in a decade when Ramadan once again overlapped with strawberry production.

REGIONS OF PRODUCTION

At this time, two primary areas of production exist: The coastal piedmont south of Agadir and the coastal region between Kenitra and Larrache. In the south there may be as many as 200 hectares in production, with a number of people planning to grow strawberries there and several producers saying that they would be expanding current plantations. In the north, it is estimated that there are 1000 hectares in production between Kenitra and Larrache, with approximately half of that occurring between Moulay-Bousselham and Larrache.

While smaller pockets of production are likely scattered around Morocco, the industry appears to have developed primarily along the western coast. Potential for production also exists throughout the interior of the country in other fruit producing regions. The primary limitation for extended production in these areas will still be high temperatures during the fruiting cycle, but possibilities for manipulating windows of harvest through the use of staggered planting dates and tunnels do exist. The opportunities for fruit and vegetable growers to diversify while taking advantage of their current production, postharvest and marketing infrastructure exists in places like Taroudant, Beni Mellal, Fes and Meknes.

VARIETIES

Through the 1970's until the present, strawberry varieties from the United States, primarily from the University of California, have predominated in Morocco. While some varieties from Europe (Spain) have been tried, none have accounted for significant production. "Tioga" was tried early on, then 'Douglas' followed by 'Chandler" and now 'Oso Grande".

'Chandler'

Currently, 'Chandler' predominates in the Moroccan industry, and may account for as much as 60% of production. It is typically the cultivar which everyone started with during the recent expansion of the industry. A University of California short day cultivar released in 1989, it is a high-yielding variety with good color and flavor. While it can be shipped with success, it does have a tender skin. This latter characteristic, in conjunction with at times being harvested too late and not always being handled with care, has resulted in some dissatisfaction with 'Chandler' in the Moroccan industry. While some growers may feel that 'Chandler' loses too much size during the season, other growers feel that complaints about the variety may reflect a lack of good management. While some of the best growers will

continue to successfully grow and export 'Chandler' for the foreseeable future, there will likely be a decrease in the production of 'Chandler' over the next few years.

'Oso Grande'
'Oso Grande' is the other major variety in Moroccan production and may account for as much as 25% of current production. Some growers who are expanding plantings seem to be favoring 'Oso Grande' over 'Chandler', and some will be planting 'Oso' much more heavily next year. It is considered to be a high yielding variety which is earlier than 'Chandler' with very large fruit and excellent fruit quality. It is a variety which ships very well. Growers describe "Oso Grande' as a large fruited variety which maintains it size well, has fewer problems in exporting, is easier to handle and yields heaviest earlier when prices are higher. Potential problems with 'Oso Grande' noted in California (albinism and split fruit) may also be found in Morocco as some fruit with colr problems and hollow centers were observed.

Other Cultivars
Other varieties in Morocco probably don't account for more than 15% of planted surface area.

'Senga Sengana'' is a standard variety in Europe, and is being produced for one exporter who ships only to the middle East.

'Tudela' is a Spanish variety being tried by some growers, but several indicated it did not look good for Morocco. One grower said that one of its parents is 'Chandler' and that it is "hard like a radish".

'Selva' a University of California day neutral variety has been tried, and while some plantings still exist, it is reported to have poor fruit quality during cooler weather

'Douglas', 'Parker' and *'Pajaro'* are University of California short day cultivars which have been tried in Morocco. They are productive and the latter two are good for shipping, but all are susceptible to weather problems and with other limitations will probably not claim significant surface area in Morocco.

One grower had tried the recent University of California release *'Seascape'* and reported that it had good color and flavor. It started producing in mid-January after a mid-October planting. It tended to fruit very heavily and then stop. This type of production behavior could be valuable if most of a cultivar's fruit was produced during periods when prices are high.

A number of other varieties from around the world have been or are currently being tried by various growers. Additional University of California varieties which should be tested include day neutral varieties such as *'Irvine'* and *'Muir'*. *'Irvine'* ships well. has smaller fruit than 'Oso Grande' but is somewhat similar in other respects. It is also earlier and has a lower temperature threshold for growth. A sibling of *'Selva'*, *'Muir'* also ships well, has better flavor but varies more in size throughout the season.

Variety Procurement and Testing
In general, larger producers would prefer to keep variety procurement and testing at the private level. Their concerns over institutionalizing the process include the amount of time it will take, the resources they already have invested in their own research and development as well as the potential results of having promising varieties widely planted across the industry and killing potential market niches. They also understood the risks inherent with having an "open door" policy for horticultural crop germplasm and the threat that this can pose to an industry. Smaller producers also do their own variety trials in order to identify varieties adapted to their area, but seemed more willing to cooperate with a public agency who would collect, preserve, maintain and evaluate germplasm.

PLANT PRODUCTION AND NURSERY SOURCES

Moroccan strawberry growers obtain their planting stock from a number of sources within and outside of Morocco. Of the estimated 90-100 million plants used in Morocco, the vast majority (95%) are produced outside of the country. Other sources include nurseries in Spain, France and Italy. Even if growers have their own dedicated nursery source, many seem to buy plants from multiple sources for comparison and/or insurance.

There are two types of plants used in the California production system: fresh dug plants and frigo plants. Fresh dug plants are typically used for the winter planting system and frigo plants for the summer planting system. In Morocco, fresh plants are widely preferred. Nurseries in Morocco, as in Spain and France, dig fresh plants after the appropriate chilling requirement has been met, (usually September) add a brief period of storage, and, as a result, most Moroccan growers plant sometime in October.

Moroccan Nursery Production
There are currently 8 hectares of licensed plant production in Morocco which produced 5.5 million plants in 1993. Of those plants, 75% were certified planting stock and 75% of total plants produced were 'Chandler". The rest of the production was divided among Selva (5%), Oso Grande' (2%), Parker (1.5%), and 'Pajaro' (1%).

The two largest Moroccan plant growers account for essentially all plant production in the country and bring tissue cultured 'Chandler' plants in as foundation stock. *Ex vitro* material is usually purchased from France or Italy, although at times plants one to two generations *ex vitro* are used if meristem plants are not available. These two nurseries are licensed to sell certified plants.

Plant multiplication rates are approximately 60-70 daughter plants per mother. Both nurseries produce approximately 3 million plants per year on a surface area of between 2.5-4 hectares.

The nurseries are at high elevation (1100-1400 m) in a volcanic clay soil. In one nursery, the soil is knifed deeply (0.6-1 m), then plowed and tilled into flat beds. One nursery uses methyl bromide soil fumigation before planting, while the other rotates land yearly.

summer. Average summer temperatures in the coastal growing area around Kenitra is in the 30-32C range while winter temperatures average 12-16C.
In general, Moroccan growers feel that a warmer, drier environment with good wind drainage had fewer disease problems. One grower described his weather problem as wind. Hot summer winds damage fruit, while cool ocean breezes put soil on plants and hinder growth.

While the industry appears to be developing primarily along the western coast of Morocco, possibilities for production also exist throughout the interior of the country in other fruit producing regions. The primary limitation to extended production in these areas is high temperatures during the fruiting cycle, but possibilities for manipulating windows of harvest through the use of staggered planting dates and tunnels do exist.

SOILS, WATER MANAGEMENT AND PLANT NUTRITION

Soil

In current coastal production regions in Morocco, soils are primarily sand which are low in organic matter. While manure is being applied in order to increase organic matter, this may also add to soil salinity and weed problems. Soil pH ranges between 8.0 to almost 9.0.

Water

Irrigation water appears to be in the range of pH 7.5 but is further reduced during fertigation. Most farms have drilled wells, have an adequate water supply and seem to have few problems with water management. Larger, diversified growers tend to have significant experience with drip irrigation and fertigation from other crops, and thus, in most cases, seem to be very comfortable with the technology.

Salinity

Soil and irrigation water salinity levels on several farms appear to fall between 1-2 EC. Growers with higher salinity should confirm that they are adequately leaching salts below the root zone in order to avoid water stress during the warmer part of the growing season when cropping is heavy and water demand is high.

Nutrient Delivery

As in other places, determining an optimal nutritional program for an annual strawberry production system is a process with many interactions among a wide variety of factors including soil conditions, microclimates, varieties and cultural practices. It is not possible to define a common system in use in Morocco, but in general the framework for nutritional management is provided by recommendations made within the California and Spanish industries. In general, strawberry growers using an intensive management style have experimented with different regimes, have settled on a general approach, but continue to seek an optimal program. This approach has inherent strengths and weaknesses. Growers will learn much about plant response and growth, but may also develop problems by attempting to over-manage nutritional aspects of culture. The goal is to optimize yield and fruit quality while carefully managing costs.

In general, in Morocco, preplant nitrogen is applied, with subsequent delivery of nutrients by fertigation. Nitrogen is one of the major components of intensive, California-style

strawberry production in order to maximize plant growth, yield and periods of production. How much nitrogen a hectare of strawberries in Morocco will require depends upon the variety being grown, the soil conditions, the unique microclimate of production, the crop load, plant architecture and cultural practices.

Nitrogen Use and Fruit Quality

For example, depending on a variety's response to nitrogen, nursery conditions, chilling hours and supplemental cold storage, plant vigor and crop load can vary greatly. Soil temperatures during different periods of the season will vary, thus creating variability in root activity, demand, and uptake ability. The problem with intensive strawberry production systems is that since yield increases with nitrogen level, more becomes better in the eyes of the producer. Some growers also feel that more nitrogen will put their fruit on the market one day in advance of their competition for a better price. Unfortunately, for example, excessive nitrogen has become a problem in the California strawberry industry and leads to a highly vegetative plant, poor fruit quality, and can trigger albinism in susceptible varieties such as 'Oso Grande'. This approach must be discouraged in the Moroccan strawberry industry as soft, light-colored, tasteless, puffy fruit will not hold up or market well for the European export market. Symptoms of possible supra optimal nitrogen levels were observed in some Moroccan strawberry fields.

PESTS AND PEST MANAGEMENT

While certainly not a complete list of pest problems in Moroccan strawberry fields, what follows are discussions of a number of problems which were often mentioned by growers, current methods of control and general commentary on other potential control strategies.

Diseases

Foliar diseases. Those which growers mentioned most often include powdery mildew (*Sphaerotheca macularis* f. sp. *fragariae*), common leaf spot (*Ramularia tulasnei*) and, with less frequency, leaf blotch (*Zythia fragariae*). These diseases can reduce plant productivity and fruit quality. Mildew is commonly controlled by using copper, and fungicides are readily available for other leaf disease problems.

Plant and root diseases. Anthracnose (*Colletotrichum acutatum*) and red stele root rot (*Phytophthora fragariae*) are concerns within the industry which, in an annual production system, can be minimized by buying quality nursery stock, soil fumigation, careful water management and good sanitation during the growing season. Metalaxyl is an effective fungicide available for use against red stele in Morocco.

Fruit diseases. While some of the previously-mentioned diseases have the ability to influence fruit quality, the most common fruit pathogen in Morocco appears to be gray mold (*Botrytis cinerea*). This disease can be a major problem from production all the way through consumer purchase. Cool, wet weather which promotes this problem occurs during the period in which Moroccan growers are trying to produce high quality fruit for export. Plastic bed mulch and judicious use of readily available fungicides can minimize this problem. On the cultural management side, some plantings in Morocco have too high a leaf to fruit ratio which reduces air drainage, promotes a moist environment and harbors

pathogens. Optimizing plant performance and architecture will reduce these problems.

Virus diseases. While growers identified viruses as a problem, specific viruses were not identified. Many strawberry viruses are common throughout the world. In an annual production system it is important to purchase good quality, certified nursery stock which is virus free. Virus-free plants derived from meristem culture, control of insect vectors in the nursery and removal of infected plants will help to safeguard Moroccan growers from serious problems with virus diseases.

Insects and Mites

Without question, arthropod pests mentioned most often included the twospotted spider mite (*Tetranychus urticae*), the red mite (*Panonychus ulmi*) and thrips (*Frankliniella* spp.).

Mites. A potentially serious pest of strawberry plantings around the world, leaves are fed on resulting in reduced plant vigor, which, if left unchecked, can result in losses in fruit quality and yield. The most effective approach to control is to combine the use of cultural practices which promote good plant vigor, the judicious use of selective acaricides, and with the use of biological controls through release or encouragement of predator populations. Weak plants with low vigor (insufficient chilling) are especially susceptible to attack, thus strong plants are the first line of defense. Miticides should be used judiciously as repeated applications can reduce photosynthetic capacity of leaves and reduce yields. It should be noted that losses in plant productivity due to mites and miticides can occur in plants which look healthy and manifest no visible symptoms. Mites can also become resistant to chemical miticides rather quickly, thus Moroccan growers who spray on a regular schedule without alternating compounds may develop a serious resistance problem in their fields.

The use of predators has worked well in places like California, where an introduced mite, *Phytoseiulus persimilis*, has helped to control twospotted spider mite. Growers make releases of this predator in addition to the established wild populations around their fields. In general, predator organisms are very susceptible to a wide range of pesticides, thus if there are any native predators in Moroccan strawberry fields, heavy pesticide usage by growers has probably kept them suppressed. If predators such as *P. persimilis* are released in trial, Moroccan growers will have to re-adjust their spray programs to encourage the survival of these beneficial organisms. A range of predators have worked in California and other locations and are worthy of trial in Morocco.

***Thrips* (*Frankliniella* spp.).** This pest is harbored by weeds and moves to strawberries during harvest or when weeds die. High populations feeding on flowers can reduce fruit size and quality. In California, *Frankliniella occidentalis* feeds on spider mite eggs, thus having a beneficial function which reduces concern over limited damage that they may do. This type of information needs to be developed for the Moroccan strawberry industry.

Nematodes

The root-knot nematode (*Meloidogyne* spp.) is a fairly common problem in the Moroccan strawberry industry. In general, nematodes such as this can severely damage the root system of the plant, interfere with nutrient and water uptake, and greatly reduce plant growth. Nematodes in the Moroccan strawberry industry can be most effectively dealt with through

127

a combination of buying high quality, certified nursery stock, preplant soil fumigation, chemical treatments such as Nemacur and land rotation.

Vertebrate Pests
Birds were mentioned as a pest of strawberries but it is difficult to assess economic losses across the entire industry.

Weeds
In Morocco as in most strawberry industries, a number of broadleaf weeds and grasses have the ability to reduce plant productivity and to harbor pests. Properly implemented preplant soil fumigation with methyl bromide appears to help in establishing essentially weed free plantations with management of specific problems as required. Within the raised beds mulched with black plastic, weeds do not seem to be major problem, while in some fields, poor weed control in row middles may be contributing to other pest problems.

Pest Control Strategies
In general, unless there is a major problem such as infested planting stock, growers do not seem very concerned about pest problems in strawberries. Few if any significant pest problems were observed. The reason for this is the level of preventative pest control which is practiced. Most growers spray from a schedule every 10-15 days regardless of the presence of pest problems. These schedules are usually synthesized from a number of sources and may not always take into account the phenology of the crop or the pest. It is likely that many unnecessary applications are made within the strawberry industry in Morocco.

Perhaps the most important element of pest control for Moroccan growers to learn is that of pest scouting. Instead of a rigid schedule of preventative sprays, growers could learn to monitor pest populations in their fields and determine the appropriate time to intervene with chemical treatment. This approach is being used somewhat by certain growers, but many growers could reduce pesticide usage significantly (reducing expenses and human exposure) and in some cases increasing plant performance and perhaps allow native and introduced beneficial organisms to act.

Integrated Pest Management (IPM)
When asked about practicing IPM, approximately half of the growers were not familiar with the principle or did not care about the concept. The other half were either doing some IPM, were planning to start or were very interested and realized that they would have to do this in the future. Pest scouting is done by some growers with a tendency perhaps to maintain a regular, preventative spray schedule early in the season when export fruit prices are highest. This prevents problems from establishing themselves, and as the season continues, some treatment decisions may be based upon on pest populations.

Pesticide Use and Future Marketing
Strawberry is one of the most intensively managed crops in the world with regard to resource inputs such as fertilizers and pesticides. In Morocco, no growers were identified who are currently using biological pesticides, predator insects or nonchemical alternatives (aside from land rotation). Vertically-integrated export growers are aware of pesticide residue standards to be set by GATT beginning in 1995. They must begin to look ahead to future strategies

for dealing with pest management practices which may reduce the export potential of their crops. Regulations and standards being developed in the United States will also force anyone considering that market to carefully evaluate pesticide usage from both a legislative and consumer preference standpoint.

Farm Worker Safety
Farm worker safety with relation to pest management is an issue which must be dealt with in Morocco as it is not uncommon for workers to apply pesticides on a regular basis with little or no protection.

PRODUCTION SYSTEM

Strawberry growers in Morocco are attempting to adapt California and Spanish production technology for their environment and seem to have made a good start. The challenge in improving strawberry production in Morocco lies in learning to manipulate the growth and development of the varieties which can be adapted to this region. Through the use of new varieties, good nursery management and creative cultural strategies, the Moroccan industry will be able to achieve good yields of quality fruit for export during periods of high demand and profitability.

Planting System
Plant Density. Moroccan growers are planting 60,000-75,000 plants per hectare in double row raised beds, and up to 120,000 on 4 row raised beds. These plant densities are similar to what is used in California (45,000-128,000 plants per hectare) for two row and four row raised beds.

Planting beds. Beds are formed with a bedshaper and black plastic is laid by machine. Single or double drip irrigation lines (for 2 or 4 row beds) are laid beneath the plastic. Beds are of similar size and height to the California system. Bed heights are in the range of 17-23 cm, and bed widths between 100-130 cm (2 rows) and 150-170 cm (4 rows). As in California, plants are spaced in the row at 27-31 cm x 27-31 cm in double rows and 20-30 cm x 20-30 cm in quad rows.

Planting Dates. Planting dates for fresh dug plants varies depending on when plants are lifted in the nursery. This usually occurs in mid to late October.

Tunnel culture. In order to accelerate the production cycle, many growers use plastic tunnels placed over the beds within several weeks of planting. These tunnels are either small hoops which fit over the beds or greenhouses which are 3 m in height covering large sections of the field. Temperature is manipulated by opening or closing plastic, thus the grower can retain heat at night and cool during the day, promoting early and perhaps extended flowering.

Season of Harvest. With the judicious use of tunnel culture, growers are able to start weak fruit production in late January\early February. As much as a third or more of the crop can be produced by the end of March, with the bulk of production coming in April and May. As prices drop in Europe and fruit quality declines in the field, production shifts to local fresh market. Berries can be frozen for IQF poly bags at any time during the harvest season through early summer. Some plantings will be picked into July depending on when higher

13

temperatures terminate flowering.

There is a desire on the part of some growers to try planting fresh dug plants earlier (early Oct) without tunnels, and frigo plants in August using tunnels to get fruit in December. In addition, other cultivars with different chilling and cropping attributes should be trialed in order to develop genotype x environmental interactions which produce a significant amount of early fruit. The use of day neutral cultivars should also be further explored in order to extend seasons of production.

Alternative Approaches. While plants in this annual-style cultural system are usually only cropped once, some growers have been using gibberellic acid (GA3), a plant growth hormone, in attempts to increase floral response and bypass a chilling period. 'Chandler' has been cropped for a second year with only a 25-35% reduction in yield. There is also a reduction in fruit quality, but the fruit was still exported. It is unclear what role gibberellins play in this response, but this underscores the critical need for gaining a better understanding of the interaction of daylength, temperature, chilling, varieties and cultural management practices on Moroccan strawberry production for export.

HARVEST AND POSTHARVEST HANDLING

Strawberries are one of the most perishable of the fruit crops, but yet have become a crop marketed worldwide. In order to be competitive in the world market for fresh strawberries, the Moroccan industry must seek to establish and maintain effective handling protocols to insure the life and quality of their product. Some of this process will require significant investment in infrastructure in order to develop the level of capacity and quality of handling this expanding industry will require. Other critical parts of establishing an optimal handling system will not require significant additional resource inputs. The latter should be aggressively pursued and relate to improved field handling of fruit which can be accomplished through good management and worker education.

The majority of California's strawberry crop is shipped by truck, and the general rule is that fruit shipped to the East Coast must have a 5-7 day market life. This is probably a similar target for exporters of fresh Moroccan strawberries.

Harvest

Strawberries are harvested by a readily available local labor force. Efforts should be made to minimize field handling of fruit. Harvesters should be adequately trained in careful fruit handling in order to avoid unnecessary bruising or other damage during harvest. It is important for harvesters not to overfill containers as this can significantly reduce fruit quality. Fresh production for export is usually sorted in flats but varying degrees of secondary handling may occur in the packing house. Crew bosses should carefully monitor product quality in the field and oversee the efficient flow of fruit form the field to holding areas. This is a key element in the production of fresh fruit for export.

Postharvest Handling

While some fruit is soon taken quickly out of the field in order to remove field heat as quickly as possible, in other cases, fruit quality is probably lost before entering the cold

chain. This is due to length of time in the field, warm breezes at field holding sites, and not holding field flats in shaded areas. Sun-exposed fruit can warm to temperatures considerably above the ambient air temperature, and even slight air movement in the shade can bring fruit close to the ambient air temperature. Growers should make a concerted effort to have an adequate capacity of shaded, protected structures in the field for holding fruit after harvest - this is a minimal investment which should be looked upon as inexpensive insurance. An efficient system of collecting flats in the field and short, regular intervals of delivery to the cold chain should be strongly encouraged.

Cooling

Optimally, fruit pulp temperature should be brought down to 1C within 3 hours of harvest. In some cases, fruit is precooled with forced air or just placed in refrigeration prior to transport. The advantages of forced air precooling are that field heat can be removed rapidly and evenly throughout the palletized product. In general, strawberries require 45-90 minutes of precooling to remove field heat. When warm fruit is cooled in a cold room over a longer period of time, condensation and temperature gradients can form throughout the product, making it susceptible to postharvest pathogens. This is of particular concern if transit temperatures will fluctuate significantly prior to arrival. The target is to hold the fruit pulp temperature at 1-2C during shipping, but for long distances by truck, modified atmospheres are worthy of trial for exported fruit.

Freezing

Most frozen fruit for the IQF market is accomplished with static freezing. Fruit are brought into the packing house, capped, sorted, put back into flats, and palletized. Higher quality fruit for local market can be sorted and packed out from this process also. Depending on available facilities, cold room capacity, and the flow of frozen product out of cold rooms for final processing, fruit may be held in precooling which has the advantage to bringing palletized loads to an even temperature throughout prior to going into the cold room. Depending on refrigeration capacity, room size and the load placed on the system, fruit can take up to 16 hours to freeze prior to final processing.

Frozen bricks are brought out of the cold room and fruit are separated through combinations of manual division, vibration and rolling through large metal cage drums. At the end of this process, fruit are put into bags and weighed. Bags can be of varying sizes and type (poly, paper) depending on customer specification. In general, frozen product observed was of good quality in both appearance and flavor.

Transport

The majority of Morocco's export tonnage is by overland truck. There are many problems associated with this system which are discussed elsewhere in this report. In general, experience with other fresh perishables such as tomatoes has allowed this channel to develop sufficiently for success with strawberries.

Air shipments are limited and expensive, although the Moroccan government is currently subsidizing shipments on Royal Air Maroc. This channel is not well developed yet for strawberries.

137

PREHARVEST AND POSTHARVEST COSTS

Preharvest seasonal production costs can be as high as $20,000 US per hectare in addition to developing infrastructure and equipment. In the major production area north of Kenitra, land costs approximately $22,000 US per hectare, while land rental averages between $275-330 US. Plant costs from most nurseries are in the range of $ 0.11-0.14 US per plant, thus a grower would invest approximately $9,000 per hectare in plants for a typical two row system and up to $15,000 US for the four row system. Plants can cost as little as $0.09 from some Spanish nurseries.

The cost of plastic greenhouse tunnels is approximately $2,000-3,000 US per hectare depending on size and materials. Drip irrigation costs run between $2,000-2,500 US. Fertilizer and pesticide costs vary on cultural practices but likely average $800-1,000 US per hectare. Labor costs will vary greatly upon cultural practices but, in general, agricultural labor costs $3.50-4.00 US per day. For example, some growers with very vegetative plants will remove leaves on a regular basis, thus adding to labor costs. An approximate range for labor costs for field and harvest labor per hectare is probably $4,500-5,000 US.

Independent of long term fixed costs, a rough budget for seasonal production of one hypothetical hectare of 'Chandler' strawberries north of Kenitra in the two row, raised bed system with black plastic mulch and plastic tunnels would be similar to the example below:

Table : Establishment Costs for one hectare of Strawberries

OPERATION	TOTAL VALUE
Land Rental	300
Plants	8,400
Drip Irrigation	2,300
Plastic tunnels	2,500
Fertilizers and Pesticides	900
Labor	4,600
Miscellaneous	1,000
Total Cost/ha	**$20,000**

It is difficult to establish average returns as yields vary as per time of season and what portion of the crop is sold for fresh export, frozen export or fresh local market. The length of the harvest season into the summer also dictates to some degree the amount of activity in the latter two categories. Earlier growers who can market more of their crop in February when prices in Europe are still high will recoup their expenses faster, while additional profitability will come from frozen and local fresh market sales. Costs for holding, packaging and transporting to point of departure range from $0.35-0.45 US per kilo.

Table : Approximate Profitability of Fresh Strawberry Production in Morocco (50 tons export)

OPERATION	TOTAL VALUE
Production/harvest Costs	$20,000
Handling/Packing/Shipping	$20,000
Sales Revenue	$75,000
Profitability	**$35,000**

ANNEX SIX

GRAPE PRODUCTION

1. Background

The grape industry plays an important social and economic role within the Moroccan fruit industry. It provides approximately 5.2 million days of employment each year in production as well as processing. This sector also generates significant revenue through the exportation of wine. With an acreage of 49,800 ha, grapes occupy about 6.4% of land planted in fruit. Of the surface area in grape production, 75% is table grapes and 25% in wine grapes.

While wine and table grapes grow in close proximity to one another, they represent two distinct industries. While both industries depend on the same genus of plant, they utilize different varieties and employ distinctly different cultural management and training systems. In Morocco, these products, their uses and their markets are different:

Table Grapes: The table grape is a perishable fresh fruit which has a high added value and competes with other summer fruits; it is not exported and has no competition from imports.

Wine Grapes: The wine grape is transformed into an exported industrial product, wine, an alcoholic beverage with a specific and highly-complex role in the food sector.

The interaction between these two market segments is minor and limited to the occasional use of table grapes for wine making purposes. This use is only significant during years when wine-grape production is insufficient, except in the Doukkala region.

2. Regions of production

The total area covered by table grapes amounts to almost 37,000 ha, divided between:

ORMVA. The zones which depend on the "Offices Regionaux de Mise en Valeur Agricole ORMVA" or Regional Office for Agricultural Development (Doukkala, Haouz, Moulouya, Souss) and account for 18,500 ha.

DPA. The zones of the "Directions Provinciales d'Agriculture, D.P.A." or Provincial Department of Agriculture: 18,500 ha.

The wine grape acreage of 13,000 ha is also divided between the two types of zones with 11,000 ha in the ORMVA zones and 2,000 ha in the DPA zones.

As can be seen in Table 7, the main regions of wine grape production are Meknes, Khemisset, and Benslimane, which represent 85% of the national wine grape acreage.

Table 9. Main regions of Moroccan wine grape production.

REGION	ACREAGE	PERCENTAGE
Mekenes	7,280	56
Khemisset	1,950	15
Benslimane	1,360	10
Gharb and Moulouya	1,530	12

During the last decade, table grape production in Morocco changed greatly in terms of acreage and cultural management. Table grape acreage increased from 29,000 ha in 1982/83 to 37,000 ha in 1992/93, a 27% increase. During the same period, wine grape acreage decreased 35% from 20,000 ha 13,000 ha. The decrease is largely due to low yields, aging of vineyards and difficulties in marketing wine. The increase of table grape acreage is due to strong demand in the local market and the general profitability of the crop.

Due to significant changes in the grape sector, the "Direction de la Production Vegetale" and the "Direction de la Planification et des Affaires Economiques" implemented a national survey in October 1993. The survey seeks to update information on acreage, varieties, age of vines, production techniques, and general problems within the industry. The results of this survey are expected in the near future.

The wine grape sector has been studied previously and will not be a focus of the current study.

3. Table grape production

The main regions of table grape production are Doukkala, Meknes, Benslimane, Haouz and Rabat-Sale. In total, these regions contain 73% of Morocco's table grape acreage (Table 8).

Table 10. Area (Ha) covered by table grape production by region.

REGION	ACREAGE (Ha)	PERCENTAGE %
Doukkala	13,670	37
Meknes	3,800	10
Benslimane	3,500	9
Haouz	3,450	9
Rabat-Sale	2,850	8

Table 11 illustrates the increase in acreage in Morocco's table grape industry over the past five years.

Table 11. Changes in Moroccan table grape production over the last five years.

YEAR	ACREAGE (Ha)	PRODUCTION (T)
1988/89	34,200	1,917
1989/90	36,600	1,570
1990/91		1,850
1991/92	36,700	2,130
1992/93	37,000	1,710

4. Varieties

The main table grape varieties grown commercially in Morocco are summarized in Table 10.

Table 12. Primary table grape varieties grown in Morocco.

VARIETY	ACREAGE (Ha)	PERCENTAGE
Doukkali	16,670	45
Valency	4,460	12
Muscat d'Alexandrie	3,070	8
Abbou	2,330	6
Muscat Italia	1,970	5
Alphonse Lavallee	930	3
Laadari	690	2
Cardinal	560	1.5
Madeleine	420	1

Other varieties cultivated on limited acreage include: Perlette, Sultanine, Dattier de Beyrouth, King's Ruby or Ruby Seedless, Flame Seedless, Early Superior, and Superior Seedless.

There is regional specialization in terms of varieties grown as reflected in Table 11.

Table 13. Moroccan table grape varieites grown by region.

VARIETY	REGION	PERCENTAGE
Abbou	Haouz	100
Doukkali	Doukkala	82
Muscat Italia	Benslimane	83
Muscat d'Alexandrie	Rabat-Sale	77
Valency	Meknes	52

The Doukkali Variety

The Doukkala region traditionally produces table grapes. The vineyards are divided among small independent producers and grow mainly the region's traditional variety, Doukkali. This variety is probably of Portuguese origin and has highly specific characteristics: extremely robust plants, very drought and disease resistant, and produces low yields of very sweet and aromatic grapes which are highly appreciated and well-known throughout most of Morocco. The vines receive rudimentary tending as the plantations are not aligned, pruning is achieved using billhooks, and the soil receives only a minimum of organic matter. Little maintenance is provided and no irrigation is used despite the availability of water.

The traditional Doukkali variety is quite dominant as it accounts for 45% of table grape acreage. Other varieties grown include: Valency (12%), Alexandria Muscat (8%), Abbou (6%), Muscat Italia (5%), Laadari (2%), Cardinal (1.5%), and Madeleine (1%).

5. Irrigation

Table grape yields are extremely variable and depend largely on whether they are grown under irrigated or nonirrigated culture.

Irrigated table grapes cover approximately 7,100 ha (19%) and are grown almost exclusively under gravitational irrigation (6,500 ha). These irrigated vineyards are primarily located within the perimeters of the ORMVA zones of Haouz (3,400 ha), Moulouya (1,300 ha), and Gharb (230 ha).

6. Season of production

The vast majority of table-grape growing regions are planted in varieties with a season which ranges from July 15 to September 10. The early or semi-early varieties (before July 15) only account for 3% of total plantings. Late-maturing varieties are virtually nonexistent.

7. Yield

Table grape production for 1992/93 is estimated to be 1,706 T, while that of the previous season was about 2,130 T. The difference is largely due to drought. While the national average yield went from 62 T/ha to 48 T/ha, in one season, yield remained the same in irrigated plantings. For the Haouz and Moulouya perimeter areas, the 91/92 yields for irrigated and nonirrigated vineyards were 165 and 120 T/ha respectively, and 170 and 130 for 1992/93. This again demonstrates the importance of irrigation in the Moroccan fruit industry.

Acreage and production by region of Moroccan table grapes are listed in Table 14.

Table 14. Acreage and average yield of Moroccan table grapes per region (1992/93).

ZONE	ACREAGE (Ha)	PRODUCTION (T)	AVERAGE YIELD (T/Ha)
1. ORMVA			
Doukkala	13,500	313	25
Haouz	3,400	578	170
Moulouya	1,300	143	130
Gharb	230	17	85
Souss-Massa	60	7	115
2. DPA			
Meknes	3,800	189	50
Benslimane	3,500	80	25
Khemisset	1,750	103	65
Rabat-Sale	2,850	79	35
Essaouira	2,050	33	15
Chefchouen	1,000	21	20
Safi	800	34	50
El Kelaa	1,200	37	30
Oujda	200	16	85
Nador	400	32	90
El Hoceima	200	2	10
Taza	250	2	7
Azilal	180	3	20
Sidi Kacem	90	2	22
Fes	50	8	150
Taounate	70	.5	5

8. Nursery production

The total number of grape plants produced in 1992/93 is estimated at 1,545,000 (table and

wine) plants, of which 900,000 plants were produced by SO.DE.A.. The region of Meknes is the primary location of nursery plant production for grapes. The plants produced on private nurseries are essentially rooted cuttings, most often taken from pruning wood. The plants generated from this type of propagation are of poor quality with negative impact on yield and production quality and plant survival.

9. Costs and returns

The detailed analysis for this section is found in annex three. The summary of the findings are:

Estimated cost of establishment of one hectare of grapes:	98,000 DH
Estimated cost of production during first year:	8,000 DH
Estimated cost of production during second & third years:	9,800 DH
Estimated annual cost of production:	26,000 DH

estimated average yields are 25 T/ha

Table xx: Return to the production of a hectare of table grapes

ITEM	COST
Cost of Production	26,000
Handling/packing/ transport	4,000
Domestic Sales	100.000
Profit	**70,000**

ANNEX SEVEN

PRODUCTION TECHNIQUES IN MOROCCO

A. CROPS IN PRODUCTION AND THEIR SURFACE AREA

Morocco produces a range of temperate tree fruit crop species, primarily for local market consumption. The tree crops in question are cultivated on approximately 58,450 hectares, or only about 8% of the total area in fruit production in Morocco. Surface area of temperate tree fruit species produced in Morocco are listed in Table 1.

Expansion in this portion of the fruit industry has come about as a result from both increased consumption within Morocco, as well as the development of export potential in several crops including peaches, apricots and sweet cherries. This increase in export activity has come primarily from growing earlier varieties at lower elevation in attempts to produce early season fruit for markets in Europe.

Tree fruit crops are produced in six primary regions: Moulouya (Berkane), Sais Valley (Fes-Meknes), Gharb (Kenitra), Tadla (Beni-Mellal), Haouz (Marrakech), and the Souss (Agadir-Taroudant).

Table 1. Surface area of cultivated temperate tree fruit crops in Morocco.

CROP	SURFACE AREA (HA)	(%)
Pome Fruits		
Apple	25,610	44
Pear	3,420	6
Quince	2,650	4.5
Loquat	320	.5
SUBTOTAL	32,000	55
Stone Fruits		
Apricot	14,360	24
Peach-Nectarine	3,960	7
Plum	7,440	13
Sweet Cherry	690	1
SubTotal	26,450	45
TOTAL	58,450	100

GENERAL CULTURAL MANAGEMENT PRACTICES FOR TREE FRUIT PRODUCTION

Obtaining Plant Material

Tree fruit growers obtain plant material from a number of countries around the world

including New Zealand, France, Spain, Italy or from nurseries within Morocco. Some growers have their own nurseries and propagate trees for their own use. Most of them import rootstocks as rooted cuttings or as seeds (for seedlings) for grafting.

Orchard Floor Management

Since water is the most limiting factor of fruit production in Morocco, the most common orchard floor management system used is clean cultivation. Weed control is accomplished by discing in the row middles and using herbicide strips or hand cultivation in the tree rows. Pre- and post emergence herbicides are used in some orchards on pome fruit tree that are 3 years or older. In stone fruits, weed control is done mainly by hand. A second orchard floor management system used is mowed row middles with herbicide strips or hand cultivation in the tree rows.

Training and Pruning

The primary objectives of tree training are accomplished during the orchard's first 3 to 4 years to give the tree structural strength to support a maximum crop load, a well distributed crop with sunlight exposure and easy accessibility for cultural management and harvest. The open center or vase-shaped tree architecture has been the most commonly used system to train stone fruits. In pome fruits the dominant training system used at present is the central leader. The central leader system is also being used for some peach orchards in addition to a dual leader or V-shaped architecture, as well as a perpendicular V system and Tatura-type trellis. In most cases, use of these systems is still in the experimental stage.

Training may start during the summer of the first growing season. The objective of summer pruning is to direct the growth of the tree by pruning undesirable branches, pinching back less desirable branches, and removing suckers to enhance growth on branches which are favorably located for use as permanent scaffold limbs. Summer pruning for tree training may be repeated in the second and third summers in some varieties to promote growth in desired branches. Summer pruning can also help spread the growth of certain varieties that tend to have upright growth habits.

Depending on the training system, primary scaffold branches and their number are selected and determined during dormant pruning. They are usually selected at the end of the first year's growth and will develop into the tree's main structural limbs which support top growth and crop load in later years. Primary scaffold branches are headed back to insure secondary branching at the desired heights. Subsequent dormant pruning allows the selection of secondary scaffolds. This training sequence is continued in the third and fourth dormant pruning seasons.

All growers prune their mature trees during the dormant season (dormant pruning) and a few summer prune as well.

Pollination

Most Moroccan fruit growers are aware of potential pollination problems, especially for species such as apple and pear, sweet cherry and certain varieties of plum. Most growers appear to choose appropriate pollenizers in appropriate numbers. Due to variations in weather from year to year, occasionally there are problems with blooming windows of pollenizers not overlapping with certain varieties as planned. All larger growers use

142

honeybees to pollinate their trees.

Fruit Thinning

Thinning is widely practiced and is critical to obtain good size fruit. Thinning is done primarily by hand and is a common practice for peaches, nectarines, apples, pears and with some plum varieties. Some growers chemically thin apples, using NAA at 5 ppm applied about 10 days after full bloom when the fruit are between 8 and 12 mm in diameter. Chemical thinning is used primarily in higher elevations and is followed by hand thinning. The growers at lower elevations prefer hand thinning over chemical thinning because the flowering period is long (lack of chilling) and the results of chemical thinning are not always predictable, thus their erratic performance could lead to overthinning.

In stone fruits, despite the many experiments conducted testing chemicals as fruit thinning agents, no material has been found which yields consistent results for commercial use. Hand thinning is practiced as early as possible after full bloom in order to achieve a significant increase in fruit size, especially for early varieties. Thinning improves fruit size, avoids the establishment of biennial bearing behaviors and advances maturity.

Fertilizers and Mineral Nutrition

For normal growth and optimal fruit production, fruit trees require 13 essential nutrients in varying amounts. Those needed in relatively large amounts are termed macronutrients: nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), and sulfur (S). Those needed in smaller concentrations are called micronutrients: chlorine (Cl), iron (Fe), manganese (Mn), zinc (Zn), boron (B), copper (Cu), and molybdenum (Mo).

Moroccan growers apply fertilizers "by the book" and do not necessarily manage nutrients for optimal growth and production, and to minimize the impact of adverse environmental effects. The amounts of fertilizers applied by Moroccan growers varies from grower to grower depending upon the soil type, species, variety, location, density of planting, yield history, and climatic conditions. Very little (if any) of the amounts of fertilizers applied in Moroccan orchards are based on soil and plant analyses. Even when the latter are performed there are no national reference standards for mineral nutrition, and the growers or laboratory personnel use standards from other countries to interpret the results and make recommendations. There has been no rigorous research done on fertilization and mineral nutrition of deciduous fruit trees under Moroccan conditions.

Nutrient problems (deficiencies and excesses) are rare, except for iron deficiency due to alkaline pH and high lime content. These problems can often be identified visually, but it is advisable to chemically analyze soil and leaf samples to confirm the nature and severity of the problem. Even without obvious, visually-observed problems, leaf samples should be taken in order to check the effectiveness of a fertilization program and to watch for gradual changes in nutrient levels.

The amounts of nutrients applied by Moroccan growers varies from 80 to 120 kg of nitrogen (ammonium sulfate 21 %, ammonium nitrate 33.5%) in two splits: 1 month before full bloom and fruit set, and at the beginning of fruit growth. For phosphorus and potassium the amounts vary for different fruit species, but fall between 60 and 80 kg of P_2O_5 as supertriple (45%) and between 160 to 200 kg of K_2O in the Fall.

143

Irrigation
The water used for irrigation of fruit trees comes from surface sources (dams, weirs) or wells. The dominant water delivery system at present is drip irrigation because, water resources are limited and this system can reduce water usage up to 60%. There have been no rigorous research studies undertaken with regard to the water requirements of deciduous fruit trees. Amounts of water applied are determined largely by the available resources. Depending on the location, variety and climatic conditions, irrigation starts in March or April and continues through September. The amount of water applied to deciduous fruit trees may vary as much as from 500 to 800 mm per hectare per year.

Pest Management - Insect and Mite pests.
A number of insect and mite pests attack Moroccan pome and stone fruits. Severity of infestations vary from year to year and from location to location. The most serious pests include:

Oriental fruit moth (*Grapholita molesta* (Busck)) is one of the most serious pests of stone fruits in Morocco. Quince is its favored host but it also attacks plum, cherry, almond and apricot.

Codling moth (*Cydia pomonella* [Linn.]) is the most serious pest of Moroccan pome fruits. In Morocco, codling moth infestations will produce 2 to 3 generations of this pest, thus the chemical spray against the first generation is very important for total control. Pheromone traps are used to monitor codling moth and to time treatments if required. Traps should be placed in orchards and accumulate degree-days (using 10C minimum \ 31C maximum thresholds) recorded after the beginning of the spring (first) flight). Maximum control is achieved with chemical applications on 75C days from the time overwintering adults emerge.

Aphids. A number of different aphids are found on fruit trees in Morocco. As a group, they are important pests due to both the physical damage they cause and to the viruses which they transmit. The mealy plum aphid, *Hyalopterus pruni* (Geoffroy) is often seen on plum trees, usually in spring. Similarly, leaf curl plum aphid, *Brachycaudus helichryse* (Kaltenbach), is often found inside curled leaves in the Spring. Green peach aphid, *Myzus persicae* (Sulzer), is occasionally seen on peach and nectarine leaves and new shoots. A number of aphids can attack apple, including *Aphis pomi de Geer*, *Eriosoma lanigerium* and *Dysaphis phataginea*.

Fruit fly, *Ceratitis capitata*, is a very common pest found in citrus and stone fruits such as peach, cherry and apricot.

The **Capnode**, *Capnodis tenebrionis* L., is by far the most serious insect pest of stone fruits in Morocco. In recent years, this beetle has devastated many plantings of apricot and cherries in the Meknes and Sefrou areas. It also attacks almond, peach and plum. Recent damage was exacerbated by severe drought (1981-85) that already had weakened the trees. The adult (Coleopteran) attacks leaves and young shoots. The larvae attacks the roots and can lead to the death of the tree. Young and weakened (drought, stress) trees are extremely vulnerable. Older, healthier trees are better able to tolerate and compensate for the attacks of the capnode larvae. It is critical to start with, and to maintain healthy trees through

proper irrigation and fertilization. Adult beetles should be collected and destroyed, particularly in the Fall as adults are actively eating and preparing to overwinter. This practice will significantly reduce subsequent larval populations and thus future generations.

Chemical treatment can also be used against capnode larvae. The larvae of this beetle attack the roots and crowns of young trees or trees weakened by drought or disease. Once the eggs have been laid, control is very difficult as the larvae are subterranean. In the past, the most effective and economical chemical applied during the oviposition period was HCH (mixed isomers of 1,2,3,4,5,6-hexachlorocyclohexane). However, HCH has been banned and the chemical currently used for this pest is ethyl chloropyrophosphate (suScon 14 G) at a concentration of 100 to 150 g per tree. The compound has residual activity for up to two years, but the treatment is expensive $350-450 US per hectare.

Mites. Mite infestations are rare in most Moroccan deciduous tree fruit orchards. Annual buildups which have occurred have probably been due to the heavy use of pesticides to control other pests. Examples of mite pests in Moroccan orchards include the yellow mite (*Eriophyes pyri*), the twospotted spider mite (*Tetranychus urticae* Koch), and the European red mite (*Panonychus ulmi* [Koch]).

Mite populations are encouraged by hot, dry, dusty conditions. Orchards should be well irrigated and dust should be kept to a minimum. Many growers have hedgerows of olive lining fields which filter much of the lateral movement of dust from road traffic. Proper pruning and adequate amounts of fertilizer to insure a vigorous orchard will also discourage mites and help trees to withstand attack.

Native predators are very important in regulating pest mite populations in orchards. European red mites can be detected by examining leaf scars and growth rings on twigs during the dormant period to look for eggs. During summer, symptoms include stippling or bronzing of leaves. High population levels may be found throughout the entire tree. While no specific numbers have been developed to initiate treatment for European red mites, there has been a general opinion that they do little damage until the orchard is heavily infested.

Diseases

The most common diseases of deciduous fruits in Morocco are:

Brown rot. Brown rot of stone fruits may be caused either by *Monilia laxa* or *Monilia fructicola*. The pathogen most often affecting peach, plum, nectarine, and cherry is *M. fructicola*; while *M. laxa* is usually associated with almond and apricot. Blossom and twig blight is controlled by one or two applications of fungicides during bloom.

Peach Leaf Curl. Peach leaf curl, also known as curly leaf, attacks peaches and nectarines throughout Morocco. It is caused by the fungus, *Taphrina deformans*. All commercial varieties of peach and nectarine are susceptible to this disease and the potential for damage is greatest when excessive or long periods of rain occur, particularly during the winter and spring. A fungicide application during the winter provides an easy and effective control.

Powdery Mildew. Caused by several different fungi, this disease afflicts many plant species.

145

On peach, plum, and nectarine, the causal pathogens are *Sphaerotica pannosa* and *Podosphaera oxycanthae*. Apple is affected by *Podosphaera leucotricha*. Growers control the disease with one to three applications of fungicides beginning at bloom, at petal fall, and two weeks afterward. The number of treatments is much higher in apple where there is an application made every 10 days from bloom through July. The control of mildew is not successful if a grower waits until the symptoms become visible.

Phytophthora Root and Crown Root. The fungal genus *Phytophthora* includes many species, a number of which (10 or more) are known to attack deciduous fruit trees. These fungi are soilborne and many are widely distributed in orchard soils. *Phytophthora* root and crown rot is normally associated with heavier and waterlogged, soils. This may be a serious problem for apple production in some areas, primarily due to the fact that the most widely planted apple rootstock, MM 106, is very susceptible to *Phytophthora*. Control of *Phytophthora* root and crown rot is based on good water management, adequate soil drainage, and chemical treatment with metylaxyl.

Crown Gall. Pome fruits are susceptible to *Agrobacterium tumefaciens*, the bacterium that causes crown gall. This bacterium only enters the plant through wounds. the disease is frequently introduced in nurseries where there are numerous opportunities for infection. Crown gall can become a serious problem when infection occurs early in the tree's life and girdles most of its crown area. Prevention of mechanical injury to plants, as well as practicing good sanitation measures, is the best control strategy.

Nursery managers commonly fumigate their soil to avoid crown gall infection, but the usefulness of fumigation for this purpose is not certain since the bacterium can easily re-invade the soil. Some people in the nursery industry claim that fumigation with a nematicide and chloropicrin-methyl bromide will reduce crown gall, but supporting data are not available. A University of California experiment with chloropicrin-methyl bromide showed that rates up to 800 pounds per acre reduced, but did not eliminate, the disease, thus fumigation was not economically feasible. Furthermore, assays of treated soil found a residual population of the pathogen which was capable of rapidly re-colonizing the fumigated soil. A nonchemical approach which kills *A. tumefaciens* is soil solarization, where the soil is covered with plastic tarps during hot summer weather.

Another approach to control of *A. tumefaciens* is a preplant dip of the root system with a commercially available suspension of the biological control agent, *A. radiobacter 84*. This treatment effectively protects against crown gall on several different host plants, including *Prunus*. These bacteria prevent crown gall infection by occupying wound sites and producing an antibiotic. This method of crown gall control is extremely successful and useful, particularly in nursery operations. This is a preventive measure which will not cure existing galls. Dilutions of household bleach have been used as preplant dips, but no experimental evidence exists to support use of chlorine bleach as a preplant dip of trees or seeds to prevent crown gall infection.

Apple scab (*Venturia inaequalis*) is a fungal disease occurring in major apple growing regions of the world. The disease is particularly severe in areas of high rainfall and relative humidity. The disease is controlled through the use of 8 to 10 fungicide sprays per year.

With the exception of aphids, mites and codling moths, where at times some pest monitoring and scouting is done prior to chemical intervention, all other diseases and insects are controlled through the use of regular, preventative sprays schedules. This style of pest management has likely led to excessive pesticide use by many growers. There is a strong need for a rigorous research program to establish economical and effective programs of chemical sprays and integrated pest management at the regional level. Such research will lead to the reduction of pesticide usage and thus the reduction of production costs, as well as the reduction of environmental and human exposure.

Harvest Maturity and Quality

The culmination of the fruit production process is harvest, and the operations surrounding harvest and postharvest handling are the final determinant of crop quality. Proper maturity at harvest is essential to marketing high quality stone fruits. Harvest maturity influences storage life and final fruit quality.

Maturity Standards. In Morocco, quite often the judgment of maturity is based upon market price rather than on its true definition as "the stage which will ensure proper completion of the ripening process". In Morocco, there are no true standards as to when fruit should be harvested. Immature fruits are more susceptible to shriveling, internal breakdown, and mechanical damage and are of inferior quality when ripe. Overmature fruits are likely to become soft and mealy and attain insipid flavor soon after harvest. Most fruits reach peak eating quality when fully ripened on the tree. However, since such ripe fruits cannot survive postharvest handling, they are usually picked mature but not ripe.

Fruit quality and condition depend upon variety, climate, cultural practices, harvest maturity, and postharvest handling. Production decisions, including planting site and variety selection, pruning, thinning, fertilization, water management, and pest management, can all influence fruit quality at harvest and during the postharvest period.

Harvest. In Morocco, harvests are carried out by picking crews primarily composed of women. Each crew has a supervisor to monitor the uniformity in picking maturity, the level of field grading being done and to insure that fruit is protected from injury. For fruits destined for local market, field grading is done by pickers and this is the only postharvest operation which the fruit is involved with prior to final delivery. If the fruit are to be exported, they are hand-graded in a packing house and put in a cold room until they are shipped by refrigerated truck. After being harvested, fruit is held in the shade to minimize warming and to avoid sun scald. If field temperatures are high, fruit should be moved into a cooling system as soon as possible, but little precooking capacity is available within the industry. Fruit is then graded, packed and sent to market local or export.

Storage. Apples to be stored for long periods of time are picked into bags that are then emptied into field bins. The bins are brought to the cold room area where they go through a fungicide drench prior to being put in the cold room. Sorting and grading into different sizes will be done once the fruit is brought out from the storage room (cold or CA). The fruit is brought out of storage depending on the demand and the market. Once the fruit are brought out from storage they are graded in tray packs and sent at night to wholesale markets.

ANNEX EIGHT

LOCAL MOROCCAN WHOLESALE MARKET INFORMATION

PRICES AND TRENDS FOR APPLES, PEARS, PEACHES AND APRICOTS

PRIX DES PECHES ET ABRICOTS

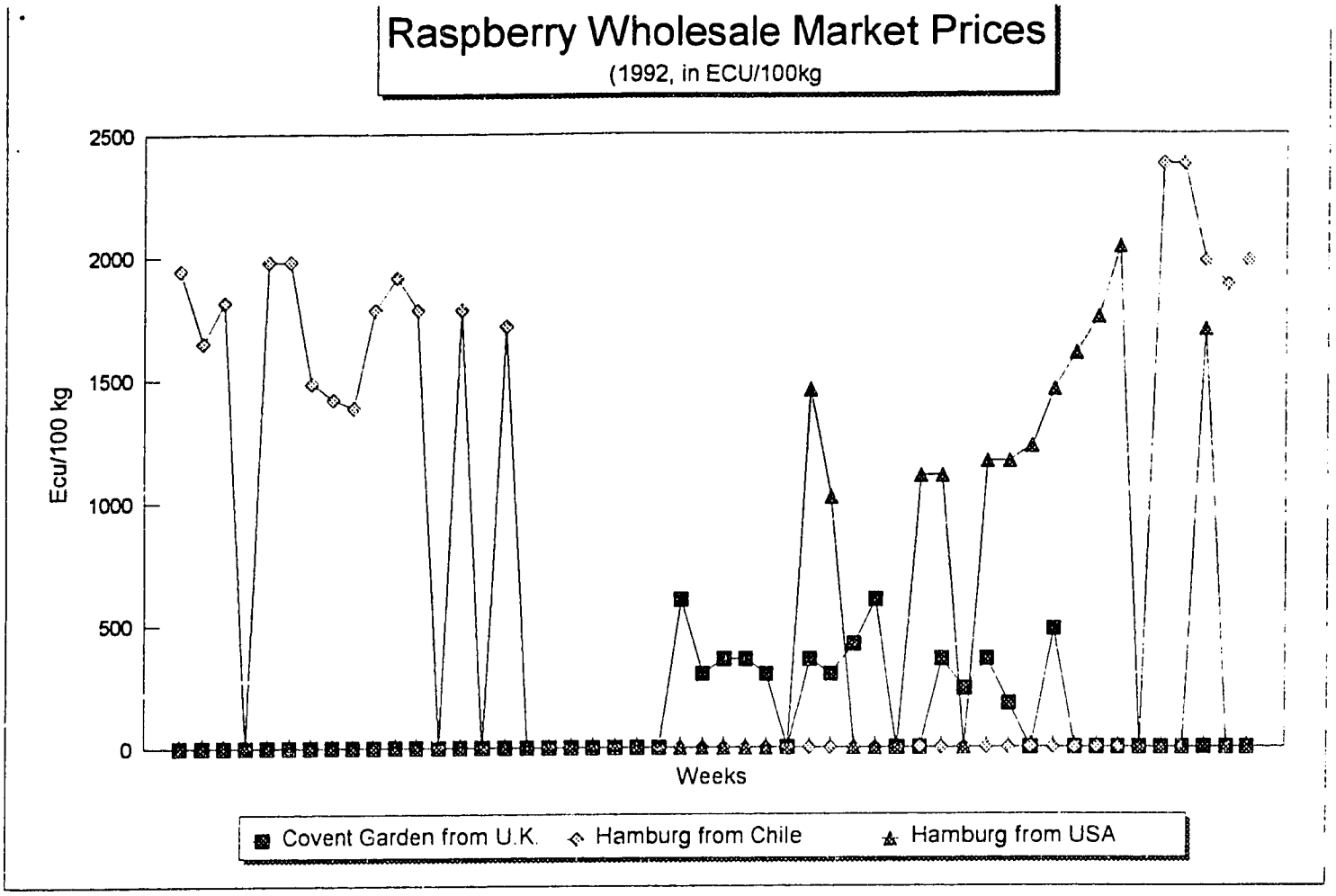
	PECHES		ABRICOTS	
MOIS	***PRIX*** (DH)	***QUANTITE*** (TONS)	***PRIX*** (DH)	***QUANTITE*** (TONS)
MAI 92	4.57	2245	3.25	4125
JUI 92	3.62	2020	2.17	3930
JUL 92	4.1	1240	-	-
AUT 92	5.25	940	-	-
		6445		8055
MAI 93	4.99	2210	3.01	7093
JUI 93	3.9	2145	2.1	4132
JUL 93	4.2	1023	-	-
AUT 93	5.35	1345	-	-
		6723		11225
MAI 94	4.53	1980	3.43	4538
JUI 94	3.84	2214	1.9	4447
JUL 94	4.16	1034	-	-
AUT 94	5.18	1104	-	-
		6332		8985

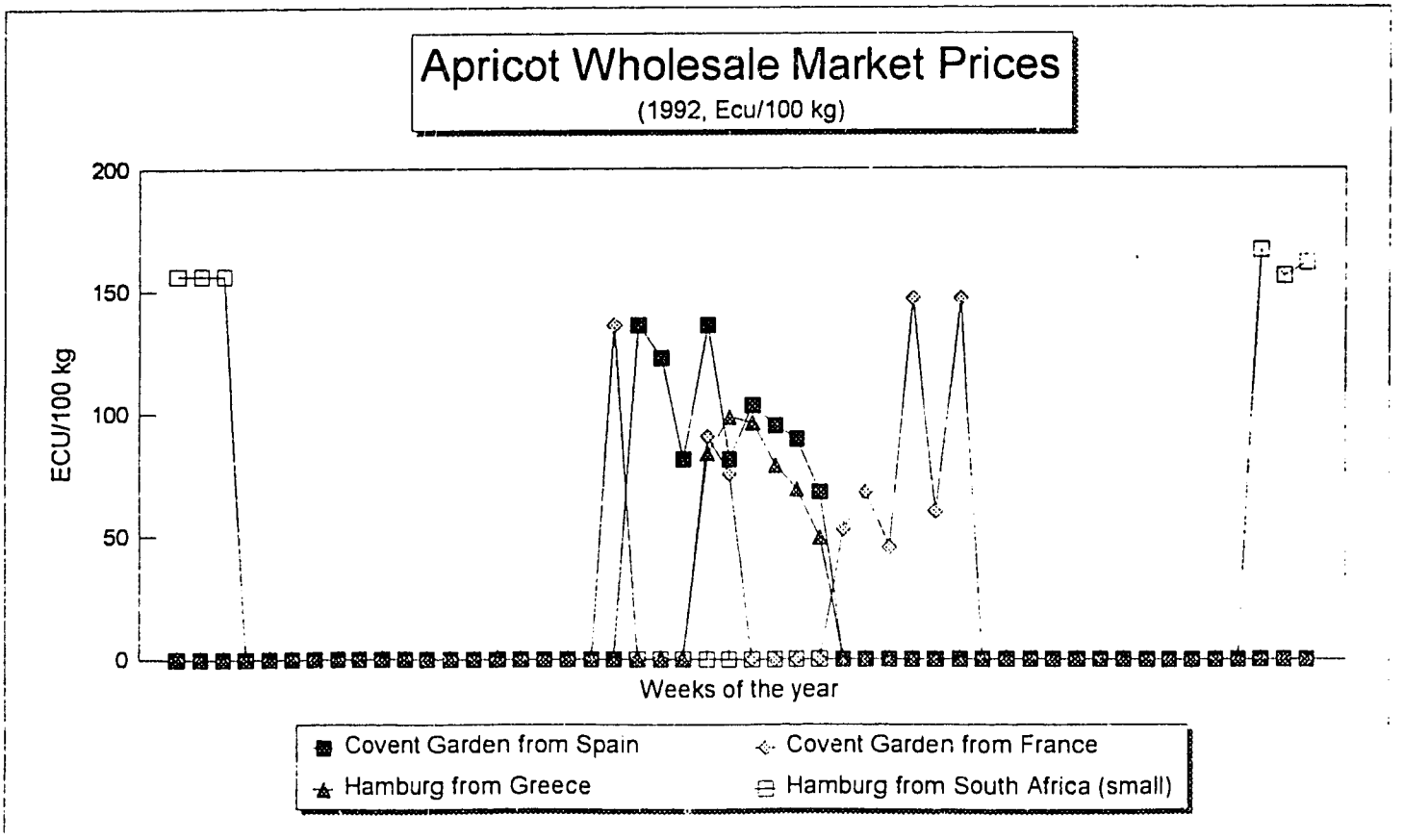
ANNEX NINE

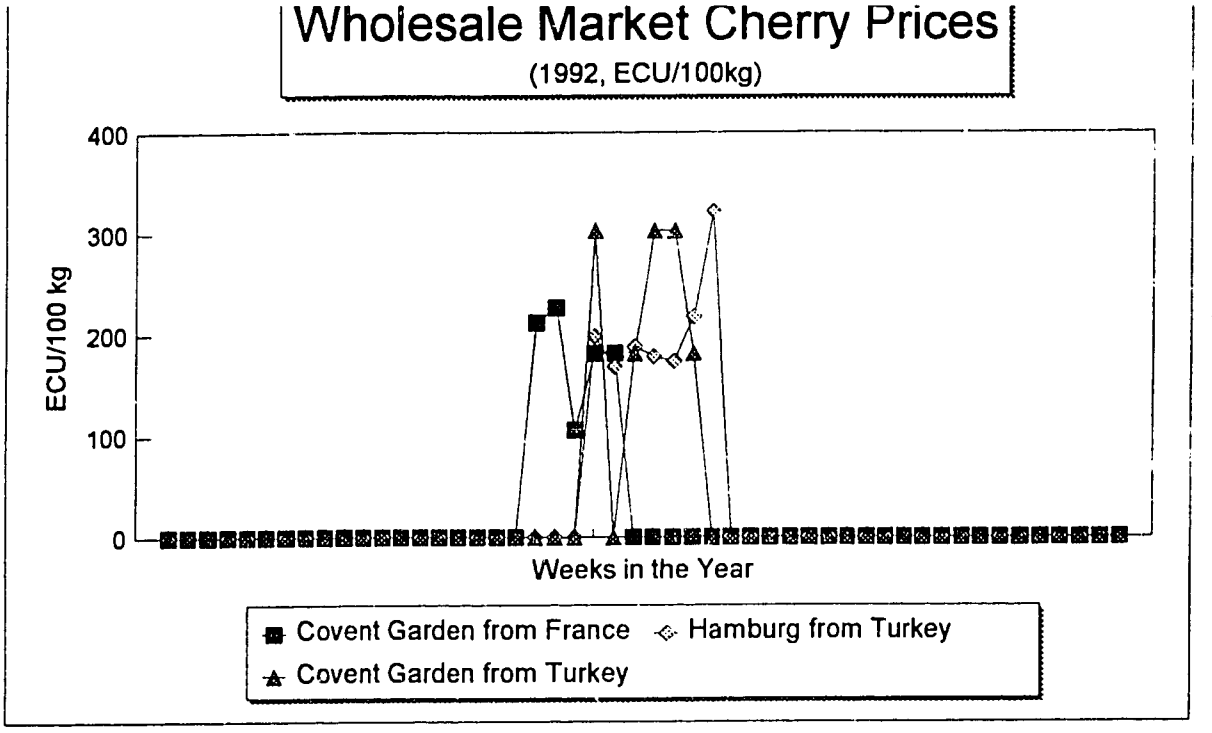
WHOLESALE MARKET INFORMATION:

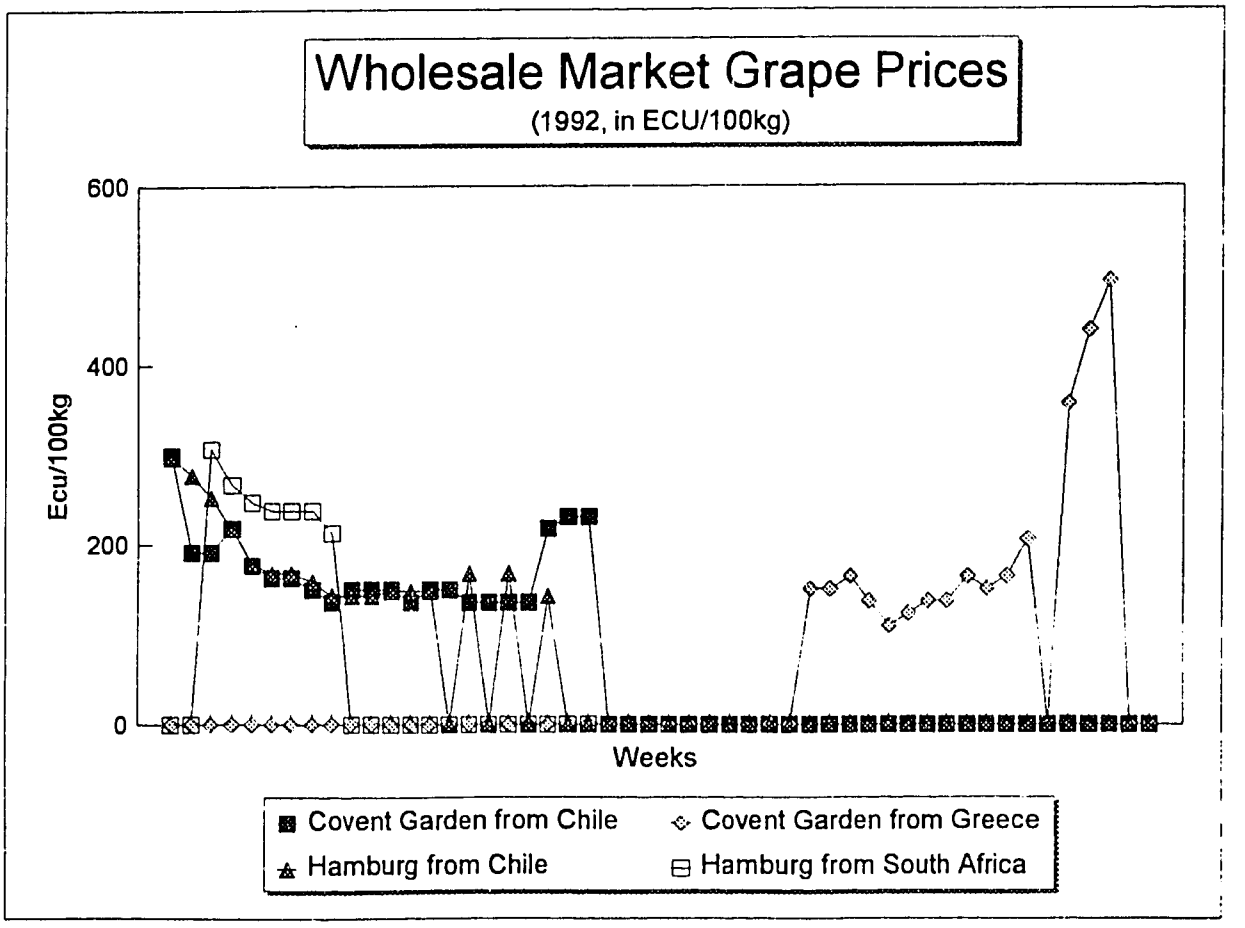
RUNGIS, COVENT GARDEN, HAMBURG

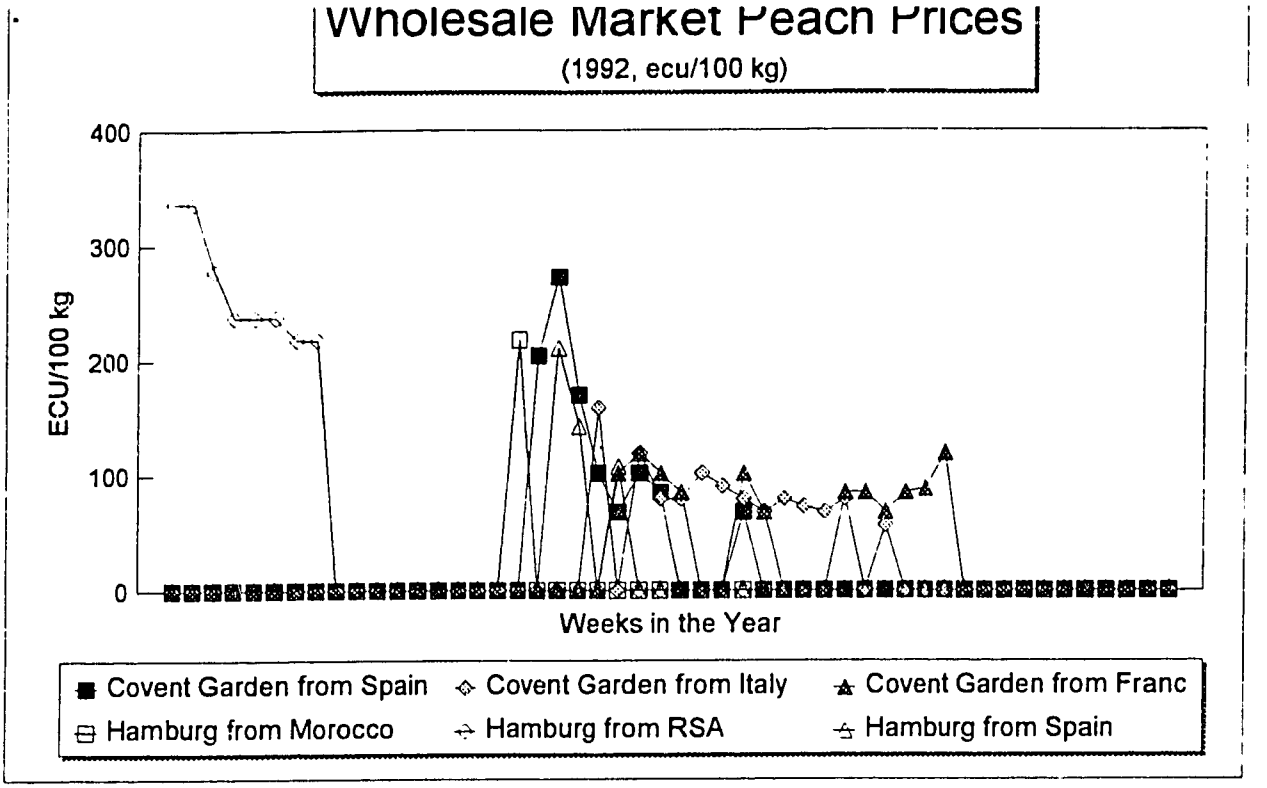
EXCHANGE RATES USED:	*1991*	*1992*	*RATE*
FRANCE	6.9733	6.8496	Francs/ECU
GERMANY	2.0507	2.0210	Marks/ECU
UNITED KINGDOM	1.4265	1.3607	ECU/£

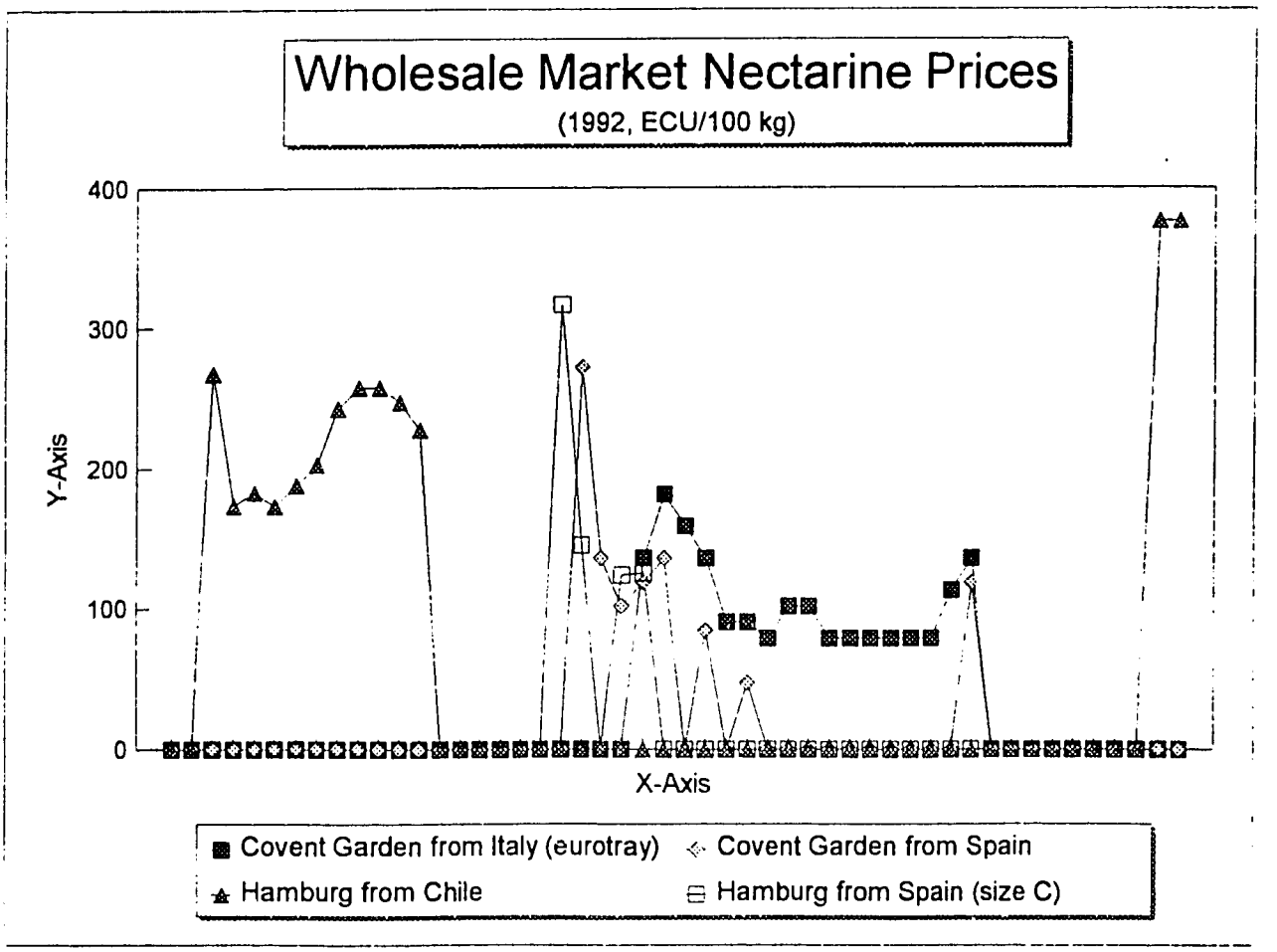

Raspberry Wholesale Market Prices
(1992, in ECU/100kg
2500
2000
1500
1000
500
0
Ecu/100 kg
Weeks
Covent Garden from U.K.
Hamburg from Chile
Hamburg from USA


Apricot Wholesale Market Prices
(1992, Ecu/100 kg)
200
150
100
50
0
ECU/100 kg
Weeks of the year
Covent Garden from Spain
Covent Garden from France
Hamburg from Greece
Hamburg from South Africa (small)


Wholesale Market Cherry Prices
(1992, ECU/100kg)
400
300
200
100
0
ECU/100 kg
Weeks in the Year
Covent Garden from France
Hamburg from Turkey
Covent Garden from Turkey


Wholesale Market Grape Prices
(1992, in ECU/100kg)
600
400
200
0
Ecu/100kg
Weeks
Covent Garden from Chile
Covent Garden from Greece
Hamburg from Chile
Hamburg from South Africa


Wholesale Market Peach Prices
(1992, ecu/100 kg)
400
300
200
100
0
ECU/100 kg
Weeks in the Year
Covent Garden from Spain
Covent Garden from Italy
Covent Garden from Franc
Hamburg from Morocco
Hamburg from RSA
Hamburg from Spain


Wholesale Market Nectarine Prices
(1992, ECU/100 kg)
400
300
200
100
0
Y-Axis
X-Axis
Covent Garden from Italy (eurotray)
Covent Garden from Spain
Hamburg from Chile
Hamburg from Spain (size C)

FRENCH FRESH PRODUCE WHOLESALE PRICES, 1991

(PRICES IN ECU)

Market	Fruit	Source	Type	Grade/Sz	Kg	Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Rungis	Apricot	Chile			100	1991	0	0	0	0	0	0	0	0	0	0	0	0
Rungis	Apricot	France		I, A	100	1991	0	0	0	0	0	131	82	72	0	0	0	0
Rungis	Apricot	France		I, AA	100	1991	0	0	0	0	0	177	117	0	0	0	0	0
Rungis	Apricot	France		I, AAA	100	1991	0	0	0	0	0	156	125	0	0	0	0	0
Rungis	Apricot	France		I, B	100	1991	0	0	0	0	0	88	62	0	0	0	0	0
Rungis	Apricot	France	Berg	I, A	100	1991	0	0	0	0	0	0	134	139	0	0	0	0
Rungis	Apricot	France	Berg	I, AA	100	1991	0	0	0	0	0	0	161	163	0	0	0	0
Rungis	Apricot	France	Berg	I, AAA	100	1991	0	0	0	0	0	0	185	178	0	0	0	0
Rungis	Apricot	France	Flam-Gold	I, A	100	1991	0	0	0	0	0	0	0	0	0	0	0	0
Rungis	Apricot	France	Lambertin	I, A	100	1991	0	0	0	0	0	0	0	0	0	0	0	0
Rungis	Apricot	France	Lambertin	I, AA	100	1991	0	0	0	0	0	190	171	0	0	0	0	0
Rungis	Apricot	France	Lambertin	I, AAA	100	1991	0	0	0	0	0	0	0	0	0	0	0	0
Rungis	Apricot	France	orangered	I, AAA	100	1991	0	0	0	0	0	0	0	0	0	0	0	0
Rungis	Apricot	Spain	galtaroja	I, A	100	1991	0	0	0	0	0	156	0	0	0	0	0	0
Rungis	Apricot	Spain	galtaroja	I, AA	100	1991	0	0	0	0	0	173	0	0	0	0	0	0
Rungis	Apricot	Spain		I, A	100	1991	0	0	0	0	136	109	0	0	0	0	0	0
Rungis	Apricot	Spain		I, AA	100	1991	0	0	0	0	0	138	0	0	0	0	0	0
Rungis	Apricot	Spain		I, B	100	1991	0	0	0	0	134	115	0	0	0	0	0	0
Rungis	Apricot	Spain	Bulida	I, A	100	1991	0	0	0	0	0	0	0	0	0	0	0	0
Rungis	Apricot	Tunisia		AA	100	1991	0	0	0	0	0	178	0	0	0	0	0	0
Rungis	Apricot	Tunisia		I, A	100	1991	0	0	0	0	184	139	0	0	0	0	0	0
Rungis	Apricot	Tunisia		I, B	100	1991	0	0	0	0	141	0	0	0	0	0	0	0
Rungis	Apricot	Tunisia		I, C	100	1991	0	0	0	0	124	0	0	0	0	0	0	0
Rungis	Cherry	Chile			100	1991	0	0	0	0	0	0	0	0	0	0	0	0
Rungis	Nectarine	France	Ch-Jne	I, EXT A	100	1991	0	0	0	0	0	0	184	158	163	0	0	0
Rungis	Nectarine	France	Ch-Jne	I, A	100	1991	0	0	0	0	0	0	167	140	128	0	0	0
Rungis	Nectarine	France	Ch-Jne	I, AA	100	1991	0	0	0	0	0	0	0	0	0	0	0	0
Rungis	Nectarine	France	Ch-Jne	I, B	100	1991	0	0	0	0	0	158	135	119	117	0	0	0
Rungis	Nectarine	France	Ch-Jne	I, C	100	1991	0	0	0	0	0	0	113	105	109	0	0	0
Rungis	Nectarine	Seville	Ch-Jne	I, A	100	1991	0	0	0	0	0	218	174	0	0	0	0	0
Rungis	Nectarine	Seville	Ch-Jne	I, B	100	1991	0	0	0	0	0	189	148	0	0	0	0	0
Rungis	Nectarine	Seville	Ch-Jne	I, C	100	1991	0	0	0	0	0	164	0	0	0	0	0	0
Rungis	Nectarine	Seville	Ch-Jne	I, D	100	1991	0	0	0	0	0	180	0	0	0	0	0	0

FRENCH FRESH PRODUCE WHOLESALE MARKET PRICES, 1992

(PRICES IN ECU)

Market	Fruit	Source	Type	Grade/Siz	Kg	Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Rungis	Apricot	Chile			100	1992	319	0	0	0	0	0	0	0	0	0	0	599
Rungis	Apricot	France		I, A	100	1992	0	0	0	0	0	86	66	0	0	0	0	0
Rungis	Apricot	France		I, AA	100	1992	0	0	0	0	0	111	80	0	0	0	0	0
Rungis	Apricot	France		I, AAA	100	1992	0	0	0	0	0	130	117	0	0	0	0	0
Rungis	Apricot	France		I, B	100	1992	0	0	0	0	0	62	58	0	0	0	0	0
Rungis	Apricot	France	Berg	I, A	100	1992	0	0	0	0	0	0	77	69	100	0	0	0
Rungis	Apricot	France	Berg	I, AA	100	1992	0	0	0	0	0	0	98	89	126	0	0	0
Rungis	Apricot	France	Berg	I, AAA	100	1992	0	0	0	0	0	0	111	103	0	0	0	0
Rungis	Apricot	France	Flam-Gold	I, A	100	1992	0	0	0	0	0	219	0	0	0	0	0	0
Rungis	Apricot	France	Lambertin	I, A	100	1992	0	0	0	0	0	88	0	0	0	0	0	0
Rungis	Apricot	France	Lambertin	I, AA	100	1992	0	0	0	0	0	137	0	0	0	0	0	0
Rungis	Apricot	France	Lambertin	I, AAA	100	1992	0	0	0	0	0	166	0	0	0	0	0	0
Rungis	Apricot	France	orangered	I, AAA	100	1992	0	0	0	0	0	204	0	0	0	0	0	0
Rungis	Apricot	Spain	galtaroja	I, AA	100	1992	0	0	0	0	0	174	0	0	0	0	0	0
Rungis	Apricot	Spain		I, A	100	1992	0	0	0	0	124	102	0	0	0	0	0	0
Rungis	Apricot	Spain		I, AA	100	1992	0	0	0	0	0	108	102	0	0	0	0	0
Rungis	Apricot	Spain	Bulida	I, A	100	1992	0	0	0	0	178	146	0	0	0	0	0	0
Rungis	Apricot	Tunisia		AA	100	1992	0	0	0	0	227	0	0	0	0	0	0	0
Rungis	Apricot	Tunisia		I, A	100	1992	0	0	0	0	221	142	0	0	0	0	0	0
Rungis	Apricot	Tunisia		I, B	100	1992	0	0	0	0	178	124	0	0	0	0	0	0
Rungis	Cherry	Chile			100	1992	394	0	0	0	0	0	0	0	0	0	701	637
Rungis	Nectarine	France	Ch-Jne	I, EXT A	100	1992	0	0	0	0	0	0	105	106	105	109	0	0
Rungis	Nectarine	France	Ch-Jne	I, A	100	1992	0	0	0	0	0	142	90	85	78	0	0	0
Rungis	Nectarine	France	Ch-Jne	I, AA	100	1992	0	0	0	0	0	146	95	89	88	0	0	0
Rungis	Nectarine	France	Ch-Jne	I, B	100	1992	0	0	0	0	0	116	74	77	69	0	0	0
Rungis	Nectarine	France	Ch-Jne	I, C	100	1992	0	0	0	0	0	96	63	0	0	0	0	0
Rungis	Nectarine	Seville	Ch-Jne	I, A	100	1992	0	0	0	0	334	208	151	0	0	0	0	0
Rungis	Nectarine	Seville	Ch-Jne	I, B	100	1992	0	0	0	0	295	173	126	0	0	0	0	0
Rungis	Nectarine	Seville	Ch-Jne	I, C	100	1992	0	0	0	0	266	144	73	0	0	0	0	0
Rungis	Nectarine	Seville	Ch-Jne	I, D	100	1992	0	0	0	0	187	128	0	0	0	0	0	0

FRENCH FRESH PRODUCE WHOLESALE MARKET PRICES, 1992

(PRICES IN ECU)

Market	Fruit	Source	Type	Grade/Siz	Kg	Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Rungis	Apricot	Chile			100	1992	319	0	0	0	0	0	0	0	0	0	0	599
Rungis	Apricot	France		I, A	100	1992	0	0	0	0	0	86	66	0	0	0	0	0
Rungis	Apricot	France		I, AA	100	1992	0	0	0	0	0	111	80	0	0	0	0	0
Rungis	Apricot	France		I, AAA	100	1992	0	0	0	0	0	130	117	0	0	0	0	0
Rungis	Apricot	France		I, B	100	1992	0	0	0	0	0	62	58	0	0	0	0	0
Rungis	Apricot	France	Berg	I, A	100	1992	0	0	0	0	0	0	77	69	100	0	0	0
Rungis	Apricot	France	Berg	I, AA	100	1992	0	0	0	0	0	0	98	89	126	0	0	0
Rungis	Apricot	France	Berg	I, AAA	100	1992	0	0	0	0	0	0	111	103	0	0	0	0
Rungis	Apricot	France	Flam-Gold	I, A	100	1992	0	0	0	0	0	219	0	0	0	0	0	0
Rungis	Apricot	France	Lambertin	I, A	100	1992	0	0	0	0	0	88	0	0	0	0	0	0
Rungis	Apricot	France	Lambertin	I, AA	100	1992	0	0	0	0	0	137	0	0	0	0	0	0
Rungis	Apricot	France	Lambertin	I, AAA	100	1992	0	0	0	0	0	166	0	0	0	0	0	0
Rungis	Apricot	France	orangered	I, AAA	100	1992	0	0	0	0	0	204	0	0	0	0	0	0
Rungis	Apricot	Spain	galtaroja	I, AA	100	1992	0	0	0	0	0	174	0	0	0	0	0	0
Rungis	Apricot	Spain		I, A	100	1992	0	0	0	0	124	102	0	0	0	0	0	0
Rungis	Apricot	Spain		I, AA	100	1992	0	0	0	0	0	108	102	0	0	0	0	0
Rungis	Apricot	Spain	Bulida	I, A	100	1992	0	0	0	0	178	146	0	0	0	0	0	0
Rungis	Apricot	Tunisia		AA	100	1992	0	0	0	0	227	0	0	0	0	0	0	0
Rungis	Apricot	Tunisia		I, A	100	1992	0	0	0	0	221	142	0	0	0	0	0	0
Rungis	Apricot	Tunisia		I, B	100	1992	0	0	0	0	178	124	0	0	0	0	0	0
Rungis	Cherry	Chile			100	1992	394	0	0	0	0	0	0	0	0	0	701	637
Rungis	Nectarine	France	Ch-Jne	I, EXT A	100	1992	0	0	0	0	0	0	105	106	105	109	0	0
Rungis	Nectarine	France	Ch-Jne	I, A	100	1992	0	0	0	0	0	142	90	85	78	0	0	0
Rungis	Nectarine	France	Ch-Jne	I, AA	100	1992	0	0	0	0	0	146	95	89	88	0	0	0
Rungis	Nectarine	France	Ch-Jne	I, B	100	1992	0	0	0	0	0	116	74	77	69	0	0	0
Rungis	Nectarine	France	Ch-Jne	I, C	100	1992	0	0	0	0	0	96	63	0	0	0	0	0
Rungis	Nectarine	Seville	Ch-Jne	I, A	100	1992	0	0	0	0	334	208	151	0	0	0	0	0
Rungis	Nectarine	Seville	Ch-Jne	I, B	100	1992	0	0	0	0	295	173	126	0	0	0	0	0
Rungis	Nectarine	Seville	Ch-Jne	I, C	100	1992	0	0	0	0	266	144	73	0	0	0	0	0
Rungis	Nectarine	Seville	Ch-Jne	I, D	100	1992	0	0	0	0	187	128	0	0	0	0	0	0

156

UNITED KINGDOM WHOLESALE MARKET PRICES, 1991

(PRICES IN ECU)

Market	Fruit	Source	Type	Grade/Sz	Kg	Year	1 JAN 11	2 JAN 18	3 JAN 25	4 FEB 1	5 FEB 8	6 FEB 15	7 FEB 22	8 MAR 1	9 MAR 8	10 MAR 15	11 MAR 22	12 MAR 29	13 APR 5	14 APR 12	15 APR 19	16 APR 26	17 MAY 3	18 MAY 10	19 MAY 17	20 MAY 24	21 MAY 31	22 JUN 7	23 JUN 14	24 JUN 21	25 JUN 28
Covent Garden	Apricot	France			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	135	103
Covent Garden	Apricot	Greece			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	119	114
Covent Garden	Apricot	Spain			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	114	108	128	143	100
Covent Garden	Cherry	France			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	571	317	254	254	254	222	254
Covent Garden	Cherry	Spain			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Cherry	Turkey			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	300	317	0	0
Covent Garden	Grape	Chile	Thompson		100	1991	285	228	200	171	143	143	157	157	171	171	171	171	171	157	157	157	171	171	214	214	0	285	0	0	0
Covent Garden	Grape	Greece	Thompson		100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Grape	Israel	Thompson		100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	385
Covent Garden	Grape	Spain	Seedless		100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Grape	USA	Thompson		100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Nectarine	France			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	207
Covent Garden	Nectarine	Italy		Standard	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	196
Covent Garden	Nectarine	Italy		Eurotray	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	168
Covent Garden	Nectarine	Spain			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	250	232	125	125	160	125
Covent Garden	Peach	France			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	143
Covent Garden	Peach	Italy		Standard	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Peach	Italy		Eurotray	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	143	133	95
Covent Garden	Peach	Spain			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	143	143	107	107	116	107
Covent Garden	Raspberry	France			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Raspberry	UK			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Raspberry	USA			100	1991	0	0	0	1258	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Market	Fruit	Source	Type	Grade/Sz	Kg	Year	26 JUL 5	27 JUL 12	28 JUL 19	29 JUL 26	30 AUG 2	31 AUG 9	32 AUG 16	33 AUG 23	34 AUG 30	35 SEP 6	36 SEP 13	37 SEP 20	38 SEP 27	39 OCT 4	40 OCT 11	41 OCT 18	42 OCT 25	43 NOV 1	44 NOV 8	45 NOV 15	46 NOV 22	47 NOV 29	48 DEC 6	49 DEC 13	50 DEC 20
Covent Garden	Apricot	France			100	1991	0	103	119	111	143	143	155	143	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Apricot	Greece			100	1991	143	0	0	159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Apricot	Spain			100	1991	71	71	143	128	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Cherry	France			100	1991	254	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Cherry	Spain			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Cherry	Turkey			100	1991	0	0	380	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Grape	Chile	Thompson		100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	628	535
Covent Garden	Grape	Greece	Thompson		100	1991	0	0	0	0	0	0	143	171	200	0	0	128	108	100	128	128	171	143	0	0	0	0	0	0	0
Covent Garden	Grape	Israel	Thompson		100	1991	371	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Grape	Spain	Seedless		100	1991	0	0	0	0	0	0	143	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Grape	USA	Thompson		100	1991	0	0	380	0	0	0	0	0	0	0	0	0	1902	0	0	0	0	0	0	0	254	0	0	0	0
Covent Garden	Nectarine	France			100	1991	0	232	125	89	0	143	0	0	125	0	0	143	0	160	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Nectarine	Italy		Standard	100	1991	143	171	160	0	0	107	0	143	0	89	0	107	114	150	160	0	0	0	0	0	0	0	0	0	0
Covent Garden	Nectarine	Italy		Eurotray	100	1991	0	226	202	143	131	143	0	155	131	119	0	107	143	143	166	178	0	0	0	0	0	0	0	0	0
Covent Garden	Nectarine	Spain			100	1991	143	143	125	89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Peach	France			100	1991	107	107	125	107	0	160	118	160	143	125	0	150	157	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Peach	Italy		Standard	100	1991	0	0	0	0	0	0	0	0	0	98	0	143	0	0	107	0	0	0	0	0	0	0	0	0	0
Covent Garden	Peach	Italy		Eurotray	100	1991	149	155	155	143	131	155	133	119	107	143	0	107	107	133	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Peach	Spain			100	1991	143	0	0	107	125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Raspberry	France			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Raspberry	UK			100	1991	0	503	503	189	189	314	377	503	314	377	0	314	0	629	503	0	0	0	0	0	0	0	0	0	0
Covent Garden	Raspberry	USA			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1258	0	0	0	0	0	0	0	0

UNITED KINGDOM WHOLESALE MARKET PRICES, 1992

(PRICES IN ECU)

Market	Fruit	Source	Type	Grade/Size Kg		Year	1 JAN 10	2 JAN 17	3 JAN 24	4 JAN 31	5 FEB 7	6 FEB 14	7 FEB 21	8 FEB 28	9 MAR 6	10 MAR 13	11 MAR 20	12 MAR 27	13 APR 3	14 APR 10	15 APR 17	16 APR 24	17 MAY 1	18 MAY 8	19 MAY 15	20 MAY 22	21 MAY 29	22 JUN 5	23 JUN 12	24 JUN 19	25 JUN 26
Covent Garden	Apricot	France			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	136	0	0	0	81	76
Covent Garden	Apricot	Greece			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	117
Covent Garden	Apricot	Spain			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	136	122	82	136	82
Covent Garden	Cherry	France			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	212	227	106	181	181	0
Covent Garden	Cherry	Spain			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	272	0	106	272	272	0
Covent Garden	Cherry	Turkey			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	302	0	181
Covent Garden	Grape	Chile	Thompson		100	1992	299	190	190	218	177	163	163	150	136	150	150	150	136	150	150	136	136	136	136	218	231	231	0	0	0
Covent Garden	Grape	Greece	Thompson		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Grape	Israel	Thompson		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Grape	Spain	Seedless		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Grape	USA	Thompson		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	363
Covent Garden	Nectarine	France			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Nectarine	Italy		Standard	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	153	119	136
Covent Garden	Nectarine	Italy		Eurotray	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	136	181
Covent Garden	Nectarine	Spain			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	272	136	102	119	136
Covent Garden	Peach	France			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	102	119	102
Covent Garden	Peach	Italy		Standard	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	85	0	0
Covent Garden	Peach	Italy		Eurotray	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	159	0	119	79
Covent Garden	Peach	Spain			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	204	272	170	102	68	102	85
Covent Garden	Raspberry	France			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Raspberry	UK			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	600	300
Covent Garden	Raspberry	USA			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Market	Fruit	Source	Type	Grade/Size Kg		Year	26 JUL 3	27 JUL 10	28 JUL 17	29 JUL 24	30 JUL 31	31 AUG 7	32 AUG 14	33 AUG 21	34 AUG 28	35 SEP 4	36 SEP 11	37 SEP 19	38 SEP 25	39 OCT 2	40 OCT 9	41 OCT 16	42 OCT 23	43 OCT 30	44 NOV 6	45 NOV 11	46 NOV 20	47 NOV 27	48 DEC 4	49 DEC 11	50 DEC 23
Covent Garden	Apricot	France			100	1992	0	0	0	0	53	68	45	147	60	147	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Apricot	Greece			100	1992	0	122	95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Apricot	Spain			100	1992	103	95	90	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Cherry	France			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Cherry	Spain			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Cherry	Turkey			100	1992	302	302	181	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Grape	Chile	Thompson		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Grape	Greece	Thompson		100	1992	0	0	0	0	0	0	0	151	151	165	137	110	123	137	137	165	151	165	206	0	357	439	494	0	0
Covent Garden	Grape	Israel	Thompson		100	1992	0	0	233	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Grape	Spain	Seedless		100	1992	0	0	0	0	0	151	110	110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Grape	USA	Thompson		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	151	0	0	0	0	0	0	0	423	544	484	0
Covent Garden	Nectarine	France			100	1992	0	0	0	0	0	85	0	0	0	0	68	0	95	119	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Nectarine	Italy		Standard	100	1992	85	85	68	0	78	88	0	0	0	0	61	0	92	0	119	0	0	0	0	0	0	0	0	0	0
Covent Garden	Nectarine	Italy		Eurotray	100	1992	159	136	91	91	79	102	102	79	79	79	79	79	79	113	136	0	0	0	0	0	0	0	0	0	0
Covent Garden	Nectarine	Spain			100	1992	0	65	0	48	0	0	0	0	0	0	0	0	0	0	119	0	0	0	0	0	0	0	0	0	0
Covent Garden	Peach	France			100	1992	85	0	0	102	68	0	0	0	85	85	68	85	88	119	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Peach	Italy		Standard	100	1992	0	0	68	0	0	85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Peach	Italy		Eurotray	100	1992	79	102	91	79	68	79	73	68	79	0	57	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Peach	Spain			100	1992	0	0	0	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Raspberry	France			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Raspberry	UK			100	1992	360	360	300	0	360	300	420	600	0	0	360	240	360	180	0	480	0	0	0	0	0	0	0	0	0
Covent Garden	Raspberry	USA			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

158

UNITED KINGDOM WHOLESALE MARKET PRICES, 1992

(PRICES IN ECU)

Market	Fruit	Source	Type	Grade/Size Kg	Year	1 JAN 10	2 JAN 17	3 JAN 24	4 JAN 31	5 FEB 7	6 FEB 14	7 FEB 21	8 FEB 28	9 MAR 6	10 MAR 13	11 MAR 20	12 MAR 27	13 APR 3	14 APR 10	15 APR 17	16 APR 24	17 MAY 1	18 MAY 8	19 MAY 15	20 MAY 22	21 MAY 29	22 JUN 5	23 JUN 12	24 JUN 19	25 JUN 26
Covent Garden	Apricot	France		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	136	0	0	0	91	76
Covent Garden	Apricot	Greece		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	117
Covent Garden	Apricot	Spain		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	136	122	82	136	82
Covent Garden	Cherry	France		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	212	227	106	181	181	0
Covent Garden	Cherry	Spain		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	272	0	106	272	272	0
Covent Garden	Cherry	Turkey		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	302	0	181
Covent Garden	Grape	Chile	Thompson	100	1992	299	190	190	218	177	163	163	150	136	150	150	150	136	150	150	136	136	136	136	218	231	231	0	0	0
Covent Garden	Grape	Greece	Thompson	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Grape	Israel	Thompson	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Grape	Spain	Seedless	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Grape	USA	Thompson	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	363
Covent Garden	Nectarine	France		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Nectarine	Italy	Standard	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	153	119	136
Covent Garden	Nectarine	Italy	Eurotray	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	136	181
Covent Garden	Nectarine	Spain		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	272	136	102	119	136
Covent Garden	Peach	France		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	102	119	102
Covent Garden	Peach	Italy	Standard	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	85	0	0
Covent Garden	Peach	Italy	Eurotray	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	159	0	119	79
Covent Garden	Peach	Spain		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	204	272	170	102	68	102	85
Covent Garden	Raspberry	France		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Raspberry	UK		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	600	300
Covent Garden	Raspberry	USA		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Market	Fruit	Source	Type	Grade/Size Kg	Year	26 JUL 3	27 JUL 10	28 JUL 17	29 JUL 24	30 JUL 31	31 AUG 7	32 AUG 14	33 AUG 21	34 AUG 28	35 SEP 4	36 SEP 11	37 SEP 18	38 SEP 25	39 OCT 2	40 OCT 9	41 OCT 16	42 OCT 23	43 OCT 30	44 NOV 6	45 NOV 11	46 NOV 20	47 NOV 27	48 DEC 4	49 DEC 11	50 DEC 23
Covent Garden	Apricot	France		100	1992	0	0	0	0	53	68	45	147	60	147	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Apricot	Greece		100	1992	0	122	95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Apricot	Spain		100	1992	103	95	90	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Cherry	France		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Cherry	Spain		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Cherry	Turkey		100	1992	302	302	181	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Grape	Chile	Thompson	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Grape	Greece	Thompson	100	1992	0	0	0	0	0	0	0	151	151	165	137	110	123	137	137	165	151	165	206	0	357	439	494	0	0
Covent Garden	Grape	Israel	Thompson	100	1992	0	0	233	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Grape	Spain	Seedless	100	1992	0	0	0	0	0	151	110	110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Grape	USA	Thompson	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	151	0	0	0	0	0	0	0	423	544	484	0
Covent Garden	Nectarine	France		100	1992	0	0	0	0	0	85	0	0	0	0	68	0	95	119	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Nectarine	Italy	Standard	100	1992	85	85	68	0	78	88	0	0	0	0	61	0	92	0	119	0	0	0	0	0	0	0	0	0	0
Covent Garden	Nectarine	Italy	Eurotray	100	1992	159	136	91	91	79	102	102	79	79	79	79	79	79	113	136	0	0	0	0	0	0	0	0	0	0
Covent Garden	Nectarine	Spain		100	1992	0	85	0	48	0	0	0	0	0	0	0	0	0	0	119	0	0	0	0	0	0	0	0	0	0
Covent Garden	Peach	France		100	1992	85	0	0	102	68	0	0	0	85	85	68	85	88	119	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Peach	Italy	Standard	100	1992	0	0	68	0	0	85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Peach	Italy	Eurotray	100	1992	79	102	91	79	68	79	73	68	79	0	57	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Peach	Spain		100	1992	0	0	0	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Raspberry	France		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Covent Garden	Raspberry	UK		100	1992	360	360	300	0	360	300	420	600	0	0	360	240	360	180	0	480	0	0	0	0	0	0	0	0	0
Covent Garden	Raspberry	USA		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

GERMAN WHOLESALE MARKET PRICES, 1991

(PRICES IN ECU)

Market	Fruit	Source	Type	Grade/Size	Kg	Year	1 JAN 2	2 JAN 9	3 JAN 16	4 JAN 23	5 JAN 30	6 FEB 6	7 FEB 13	8 FEB 20	9 FEB 27	10 MAR 6	11 MAR 13	12 MAR 20	13 MAR 27	14 APR 3	15 APR 10	16 APR 17	17 APR 24	18 MAY 1	19 MAY 8	20 MAY 15	21 MAY 22	22 MAY 29	23 JUN 5	24 JUN 12	25 JUN 19	26 JUN 26
Hamburg	Apricot	Greece			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	278	188	161	
Hamburg	Apricot	South Africa		M, 40-45mm	100	1991	0	190	189	190	195	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Apricot	South Africa		L, 45-50mm	100	1991	0	241	210	231	226	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Apricot	Spain		NO 3	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	137	107	0	0	
Hamburg	Apricot	Spain		NO 4	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	181	122	122	117	
Hamburg	Apricot	Spain		NO 5	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	176	137	137	127	
Hamburg	Apricot	Spain		NO 6	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	148	141	137	
Hamburg	Apricot	Spain		NO 7	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	156	141	148	
Hamburg	Apricot	Spain		NO 8	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	156	
Hamburg	Apricot	Spain		NO 9	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	195	0	0	0	
Hamburg	Apricot	Turkey			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	195	195	0	
Hamburg	Cherry	Poland				1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Cherry	Spain	Burlat			1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Cherry	Turkey				1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Cherry	USA	Burlat			1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Grape	Chile	Thompson		100	1991	371	283	244	224	180	146	161	161	165	168	176	168	161	161	168	168	168	0	195	215	229	224	0	0	0	
Hamburg	Grape	Egypt	Thompson		100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Grape	Israel	Thompson		100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	366	0	
Hamburg	Grape	South Africa	Thompson		100	1991	0	0	0	273	0	200	205	205	215	219	219	219	0	0	0	0	0	0	0	0	0	0	0	0	0	

Market	Fruit	Source	Type	Grade/Size	Kg	Year	26 JUN 26	27 JUL 3	28 JUL 10	29 JUL 17	30 JUL 24	31 JUL 31	32 AUG 7	33 AUG 14	34 AUG 21	35 AUG 28	36 SEP 4	37 SEP 11	38 SEP 18	39 SEP 25	40 OCT 2	41 OCT 9	42 OCT 16	43 OCT 23	44 OCT 30	45 NOV 6	46 NOV 13	47 NOV 20	48 NOV 27	49 DEC 4	50 DEC 11	51 DEC 18
Hamburg	Apricot	Greece			100	1991	107	98	112	112	107	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Apricot	South Africa		M, 40-45mm	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
Hamburg	Apricot	South Africa		L, 45-50mm	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
Hamburg	Apricot	Spain		NO 3	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Apricot	Spain		NO 4	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Apricot	Spain		NO 5	100	1991	98	59	117	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Apricot	Spain		NO 6	100	1991	98	59	132	137	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Apricot	Spain		NO 7	100	1991	98	59	146	137	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Apricot	Spain		NO 8	100	1991	98	59	0	137	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Apricot	Spain		NO 9	100	1991	98	0	0	137	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Apricot	Turkey			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Cherry	Poland				1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Cherry	Spain	Burlat			1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Cherry	Turkey				1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Cherry	USA	Burlat			1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Grape	Chile	Thompson		100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Grape	Egypt	Thompson		100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Grape	Israel	Thompson		100	1991	371	332	302	293	278	273	258	244	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hamburg	Grape	South Africa	Thompson		100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

GERMAN WHOLESALE MARKET PRICES, 1991

(PRICES IN ECU)

Market	End	Source	Type	Grade/Size	Kg	Year	1 JAN 2	2 JAN 9	3 JAN 16	4 JAN 23	5 JAN 30	6 FEB 6	7 FEB 13	8 FEB 20	9 FEB 27	10 MAR 6	11 MAR 13	12 MAR 20	13 MAR 27	14 APR 3	15 APR 10	16 APR 17	17 APR 24	18 MAY 1	19 MAY 8	20 MAY 15	21 MAY 22	22 MAY 29	23 JUN 5	24 JUN 12	25 JUN 19	26 JUN 26
Hamburg	Nectarine	Chile			100	1991	312	195	0	234	218	164	140	118	152	170	176	0	0	173	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Greece		A	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	127
Hamburg	Nectarine	Greece		AA	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Greece		B	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	157	0
Hamburg	Nectarine	Greece		C	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	108	98
Hamburg	Nectarine	Greece		D	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Spain		AAA	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Spain		AA	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Spain		A	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	219	207	256
Hamburg	Nectarine	Spain		B	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	256	244	207	183	214
Hamburg	Nectarine	Spain		C	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	232	195	171	158	178
Hamburg	Nectarine	Spain		D	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	177	158	128	122	0
Hamburg	Peach	Morocco			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	212	244	0	0	0	0	0
Hamburg	Peach	South Africa		23ER	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Peach	South Africa		25ER	100	1991	0	302	302	302	322	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Peach	South Africa		28ER	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Peach	Spain		AA	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	213	189	171	0	0
Hamburg	Peach	Spain		A	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	201	177	165	0	151
Hamburg	Peach	Spain		B	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	390	268	177	158	146	0	128
Hamburg	Peach	Spain		C	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	341	207	158	146	128	0	0
Hamburg	Peach	USA				1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Raspberry	Chile			100	1991	0	0	1138	1138	0	0	1138	1138	1138	1170	1365	0	1235	1235	1268	1690	0	0	2016	0	0	0	2471	0	0	1365
Hamburg	Raspberry	Holland			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1300	0	0
Hamburg	Raspberry	USA			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Chile			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Greece		A	100	1991	0	0	0	0	90	96	82	87	84	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Greece		AA	100	1991	0	0	0	0	101	0	87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Greece		B	100	1991	0	202	167	98	74	86	67	77	74	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Greece		C	100	1991	0	161	143	60	0	70	62	0	65	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Greece		D	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Spain		AAA	100	1991	0	238	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Spain		AA	100	1991	0	238	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Spain		A	100	1991	219	226	205	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Spain		B	100	1991	201	208	185	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Spain		C	100	1991	165	0	164	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Spain		D	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Peach	Morocco			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Peach	South Africa		23ER	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	351	322	351	0	0
Hamburg	Peach	South Africa		25ER	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	449	0	0	332	273	312	0	0
Hamburg	Peach	South Africa		28ER	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	380	0	0	293	234	0	0	0
Hamburg	Peach	Spain		AA	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Peach	Spain		A	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Peach	Spain		B	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Peach	Spain		C	100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Peach	USA				1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Raspberry	Chile			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2341	1951	1886	0
Hamburg	Raspberry	Holland			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Raspberry	USA			100	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1434	0	1793	0	0	0	0	0	0

GERMAN WHOLESALE MARKET PRICES, 1992

(PRICES IN ECU)

Market	Fruit	Source	Type	Grade/Size	Kg	Year	1 JAN 8	2 JAN 15	3 JAN 22	4 JAN 29	5 FEB 5	6 FEB 12	7 FEB 19	8 FEB 26	9 MAR 4	10 MAR 11	11 MAR 18	12 MAR 25	13 APR 1	14 APR 8	15 APR 15	16 APR 22	17 APR 29	18 MAY 6	19 MAY 13	20 MAY 20	21 JUN 3	22 JUN 10	23 JUN 17	24 JUN 24	25 JUL 1
Hamburg	Apricot	Greece		45-50MM	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	84	99
Hamburg	Apricot	South Africa		S. 35-40mm	100	1992	156	156	156	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Apricot	South Africa		M 40-45mm	100	1992	156	156	156	135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Apricot	South Africa		L. 45-50mm	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Apricot	Spain		NO 3	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	158	99	0	0	0	0
Hamburg	Apricot	Spain		NO 4	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	156	129	0	79	79	0
Hamburg	Apricot	Spain		NO 5	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	139	0	79	79	0
Hamburg	Apricot	Spain		NO 6	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	148	0	79	79	0
Hamburg	Apricot	Spain		NO 7	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	158	0	79	79	0
Hamburg	Apricot	Spain		NO 8	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Apricot	Spain		NO 9	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Apricot	Turkey			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	89	8
Hamburg	Cherry	Poland			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Cherry	Spain	Burlat		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	408	223	0	0	0	0
Hamburg	Cherry	Turkey	Napoleon		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	198	168	18
Hamburg	Cherry	USA	Burlat		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Grape	Chile	Thompson		100	1992	297	277	252	218	178	168	168	158	143	143	143	148	148	148	0	168	0	168	0	143	0	0	0	0	0
Hamburg	Grape	Egypt	Thompson		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Grape	Israel	Thompson		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	327
Hamburg	Grape	South Africa	Thompson		100	1992	0	0	307	267	247	238	238	238	213	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Market	Fruit	Source	Type	Grade/Size	Kg	Year	26 JUL 8	27 JUL 15	28 JUL 22	29 JUL 29	30 AUG 5	31 AUG 12	32 AUG 19	33 AUG 26	34 SEP 2	35 SEP 9	36 SEP 16	37 SEP 23	38 SEP 30	39 OCT 7	40 OCT 12	41 OCT 21	42 OCT 28	43 NOV 4	44 NOV 11	45 NOV 18	46 NOV 25	47 DEC 2	48 DEC 9	49 DEC 16	50 DEC 23
Hamburg	Apricot	Greece		45-50MM	100	1992	96	79	69	49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Apricot	South Africa		S. 35-40mm	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	167	158	16
Hamburg	Apricot	South Africa		M. 40-45mm	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Apricot	South Africa		L. 45-50mm	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Apricot	Spain		NO 3	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Apricot	Spain		NO 4	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Apricot	Spain		NO 5	100	1992	0	0	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Apricot	Spain		NO 6	100	1992	0	0	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Apricot	Spain		NO 7	100	1992	0	0	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Apricot	Spain		NO 8	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Apricot	Spain		NO 9	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Apricot	Turkey			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Cherry	Poland			100	1992	0	0	193	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Cherry	Spain	Burlat		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Cherry	Turkey	Napoleon		100	1992	178	173	218	322	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Cherry	USA	Burlat		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Grape	Chile	Thompson		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Grape	Egypt	Thompson		100	1992	317	297	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Grape	Israel	Thompson		100	1992	297	0	0	124	119	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Grape	South Africa	Thompson		100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

62

GERMAN WHOLESALE MARKET PRICES, 1992

(PRICES IN ECU)

Market	Fruit	Source	Type	Grade/Size	Kg	Year	1 JAN 8	2 JAN 15	3 JAN 22	4 JAN 29	5 FEB 5	6 FEB 12	7 FEB 19	8 FEB 26	9 MAR 4	10 MAR 11	11 MAR 18	12 MAR 25	13 APR 1	14 APR 8	15 APR 15	16 APR 22	17 APR 29	18 MAY 6	19 MAY 13	20 MAY 20	21 JUN 3	22 JUN 10	23 JUN 17	24 JUN 24	25 JUL 1
Hamburg	Nectarine	Chile			100	1992	0	0	267	173	183	173	188	203	242	257	257	247	228	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Greece		A	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	137
Hamburg	Nectarine	Greece		AA	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Greece		B	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	111
Hamburg	Nectarine	Greece		C	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	83
Hamburg	Nectarine	Greece		D	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Spain		AAA	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Spain		AA	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	239	0
Hamburg	Nectarine	Spain		A	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	198	0	173	193	0
Hamburg	Nectarine	Spain		B	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	185	0	148	159	0
Hamburg	Nectarine	Spain		C	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	317	145	0	124	125	0
Hamburg	Nectarine	Spain		D	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	0
Hamburg	Peach	Morocco			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	218	0	0	0	0	0	0	0
Hamburg	Peach	South Africa		20ER	100	1992	0	0	317	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Peach	South Africa		23ER	100	1992	336	336	277	238	238	238	216	218	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Peach	South Africa		25ER	100	1992	297	297	257	238	238	238	218	218	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Peach	South Africa		28ER	100	1992	238	238	238	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Peach	Spain		AA	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	211	0	0	0	0	0
Hamburg	Peach	Spain		A	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	211	142	0	107	0	0
Hamburg	Peach	Spain		B	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	198	111	0	95	0	0
Hamburg	Peach	Spain		C	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	158	87	0	72	0	0
Hamburg	Peach	USA			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	544	0	0	0	0	0	0	0	0	0
Hamburg	Raspberry	Chile			100	1992	1946	1649	1814	0	1979	1979	1484	1418	1385	1781	1913	1781	0	1781	0	1715	0	0	0	0	0	0	0	0	0
Hamburg	Raspberry	Holland			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2804	0	2199	0	0	1155	0	825	660	0
Hamburg	Raspberry	USA			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Market	Fruit	Source	Type	Grade/Size	Kg	Year	26 JUL 8	27 JUL 15	28 JUL 22	29 JUL 29	30 AUG 5	31 AUG 12	32 AUG 19	33 AUG 26	34 SEP 2	35 SEP 9	36 SEP 16	37 SEP 23	38 SEP 30	39 OCT 7	40 OCT 12	41 OCT 21	42 OCT 28	43 NOV 4	44 NOV 11	45 NOV 18	46 NOV 25	47 DEC 2	48 DEC 9	49 DEC 16	50 DEC 23
Hamburg	Nectarine	Chile			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	376	376
Hamburg	Nectarine	Greece		A	100	1992	0	0	0	82	0	62	49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Greece		AA	100	1992	0	0	0	92	0	62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Greece		B	100	1992	0	72	0	0	0	56	49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Greece		C	100	1992	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Greece		D	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Spain		AAA	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Spain		AA	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Spain		A	100	1992	0	0	77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Spain		B	100	1992	91	0	77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Spain		C	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Nectarine	Spain		D	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Peach	Morocco			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Peach	South Africa		20ER	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	356	0	376	0	0	0	0
Hamburg	Peach	South Africa		23ER	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Peach	South Africa		25ER	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	317	0	307	327
Hamburg	Peach	South Africa		28ER	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	317	0	317	317	0	0	307
Hamburg	Peach	Spain		AA	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Peach	Spain		A	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Peach	Spain		B	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Peach	Spain		C	100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Peach	USA			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Raspberry	Chile			100	1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2375	2375	1979	1880	1979
Hamburg	Raspberry	Holland			100	1992	0	0	0	0	0	0	0	0	544	0	1319	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamburg	Raspberry	USA			100	1992	0	0	0	0	1455	1019	0	0	0	1106	1106	0	1164	1164	1222	1455	1601	1746	2037	0	0	0	1701	0	0

ANNEX TEN

MOROCCAN FRESH FRUIT EXPORTING COMPANIES

ANNEX TEN
LIST OF MOROCCAN FRESH FRUIT EXPORTING COMPANIES
1993

Source: EACCE

EXPORTER	PRODUCT
AGCO MOROCCO	APRICOTS
AGROBIOMAR	APRICOTS
GAL GAMECHE (STE)	APRICOTS
ROYAL INDUS. MAROCAINE SALIMA	APRICOTS
STE SOFIMADE KEVINE (BERDI)	APRICOTS
SOCOPEX (STE)	APRICOTS
RINAD (STE)	APRICOTS
CHKIR EL MAHJOUB	APRICOTS
ARBORICOLE OULMES (STE)	CHERRIES
STE SOFIMADE KEVINE (BERDI)	CHERRIES
AGCO MOROCCO	CHERRIES
DOMAINES ROYAUX	KUMQUATS
SAPIAMA	MELON CANTALOUPE
MARAISSA (STE)	MELON CANTALOUPE
SOCOCEMA (COOP)	MELON CANTALOUPE
SOL-DIVE (STE)	MELON CANTALOUPE
ZNIBER BRAHIM	MELON CANTALOUPE
BOUDOUH	MELON CANTALOUPE
ESMAFRAISE	MELON CANTALOUPE
GHYAT MARRAKECH	MELON CANTALOUPE
NECTAR PRIM (STE)	MELON GALIA
SOCOCEMA (COOP)	MELON GALIA
SOCIETE AGRI FOOD INTERNATIONAL	MELON GALIA
SAPIAMA	MELON GALIA
ESMAFRAISE	MELON GALIA
OFIPAG (STE)	MELON GALIA
MEDI PRIM (STE)	MELON GALIA
SOL-DIVE (STE)	MELON GALIA
DOUNA EXPORT (STE)	MELON GALIA
BOUCHOUKOU BRAHIM	MELON GALIA
DOMAINES ROYAUX	MELON GALIA
M'BROUKA	MELON GALIA

ARBORICOLE COLMEC (STE)	MELON GALIA
DELICAS	MELON GALIA
LARBI SEKKAT	MELON GALIA
AGRISUM (STE)	MELON GALIA
VEKIMA-MAROC (STE)	MELON GALIA
LAIDICO IMPORT-EXPORT	MELON GALIA
AGROBIOMAR	MELON GALIA
BOUDOUH	MELON GALIA
STE SOFIMADE KEVINE (BERDI)	MELON GALIA
GHYAT MARRAKECH	MELON GALIA
MARAISSA (STE)	MELON GALIA
HERITIERS ABDES MECHICHE ALAMI	NECTARINES
SOCIETE SOMARROZ	NECTARINES
MLAH M'CHICHE ALAMI	NECTARINES
BENZIT MOHAMED	NECTARINES
AVON MAROC (STE)	PEACHES
BENZIT MOHAMED	PEACHES
STE SOFIMADE KEVINE (BERDI)	PEACHES
TOUBKAL FLEUR	PEACHES
CHKIR EL MAHJOUB	PEACHES
HERITIERS ABDES MECHICHE ALAMI	PEACHES
GHYAT MARRAKECH	PEACHES
MLAH M'CHICHE ALAMI	PEACHES
MAROSAN	PEACHES
DOMAINES ROYAUX	PEACHES
CHOURAK LARBI	STRAWBERRIES
STE SOFIMADE KEVINE (BERDI)	STRAWBERRIES
AGCO MOROCCO	STRAWBERRIES
ALCONERA MAROC	STRAWBERRIES
MEDI PRIM (STE)	STRAWBERRIES
BEERENSTARK (KORVRAN)	STRAWBERRIES
KORVRAN	STRAWBERRIES
FRUITIERE KAISAR	STRAWBERRIES
SOPROPRIM	STRAWBERRIES
AVON MAROC (STE)	STRAWBERRIES
FELGAR (STE)	STRAWBERRIES
PROMOTION COMM DU DROIT (S.A)	STRAWBERRIES
CONTINENTAL HISPANO MARROQUI	STRAWBERRIES
KORVRAN	STRAWBERRIES
ESMAFRAISE	STRAWBERRIES
BISMILLAH	STRAWBERRIES
COMPAGNIE AGRICOLE LUKUS	STRAWBERRIES
FELGAR	STRAWBERRIES
SAPIAMA	STRAWBERRIES
GRINA (STE)	STRAWBERRIES

ANNEX ELEVEN

COLD STORAGE IN MOROCCO

Table 1.	Evolution of the Cold Storage Capacity in Morocco compared to Population 1924-1993
Table 2.	Evolution of Storage Capacity by Station and by Rooms
Table 3.	Distribution of Cold Storage Capacity by Region
Table 4.	Distribution of Cold Storage Capacity between Private and Public Sectors
Table 5.	Freezing and Deepfreezing capacity
Table 6.	Distribution of Cold Storage by Unit Capacity
Table 7.	Evolution of quantities stored by region
Table 8.	Labor used in the Cold Storage sector, by Region
Table 9.	Distribution of Cold Storage Capacity by type of Storage: 0 negative, 0 positive, and controlled atmosphere

EVOLUTION DE LA CAPACITE D'ENTREPOSAGE EN M3 ET EN T PAR RAPPORT A LA POPULATION TOTALE DU MAROC

Tableau n° 1

ANNEE	POPULATIONS (MILLIERS)	CAPACITE M3	CAPACITE T	CAP. EN M3 POUR 1000 HAB.	CAP. EN T POUR 1000 HAB.
1924	4 933	315	6	0.06	0,00
1230	5 404	465	11	0.09	0,00
1935	6 296	895	374	0.14	0,06
1945	8 617	10 745	2 844	1.25	0,33
1950	9 004	13 796	3 775	1.53	0,42
1960	11 626	72 996	15 423	6.28	1.33
1965	13 323	85 786	21 646	6.44	1,62
1970	15 310	110 602	25 533	7.22	1,67
1975	17 300	405 829	80 701	23.46	4,66
1980	20 050	572 645	120 935	28,56	6,03
1985	22 060	764 247	147 617	34,64	6,69
1989	25 000	923 430	204 473	36,94	8,18
1993	26 000	1 355 951	285 851	52.15	10,99

EVOLUTION DES CAPACITES MOYENNES EN M3 ET EN T PAR CHAMBRE ET PAR ENTREPOT

Tableau N°2

ANNEE	Capacité Entreposage		Taux annuel d'acroissement de la capacité (% par an)	Nombre Entrepôts	Capacité Moyenne par entrepôt		Nombre Chambre	Nbre chambre par entrepôt	Capacité moyenne par chambre	
	M3	T			M3	T			M3	T
1924	315	6		1	315	6	2	2	158	3
1930	465	11	7,94%	2	233	6	3	2	155	4
1935	895	374	18,49%	5	179	75	12	2	75	31
1940	10 495	2 694	214,53%	7	1 499	385	36	5	292	75
1945	10 745	2 844	0,48%	8	1 343	356	40	5	269	71
1950	13 796	3 775	5,68%	14	985	270	52	4	265	73
1955	65 694	13 928	75,24%	27	2 433	516	180	7	365	77
1960	72 996	15 423	2,22%	37	1 973	417	210	6	348	73
1965	85 786	21 646	3,50%	43	1 995	503	232	5	370	93
1970	110 602	25 533	5,79%	50	2 212	511	281	6	394	91
1975	405 829	80 701	53,39%	72	5 637	1 121	433	6	937	186
1980	572 645	120 935	8,22%	107	5 352	1 130	561	5	1 021	216
1985	764 247	147 617	6,69%	163	4 689	906	793	5	964	186
1989	923 430	204 473	5,21%	237	3 896	863	1 050	4	879	195
1993	1 355 951	285 851	11,71%	387	3 504	739	1 643	4	825	174

LOCALISATION ET REPARTITION DES CAPACITES DES UNITES UTILISATRICES DE FROID PAR PROVINCE ET PAR REGION ECONOMIQUE

Tableau n°3

REGION ECONOMIQUE PROVINCE	Nbre UNITES	%	CAPACITE en M3	%	CAPACITE en T	%	VIANDES	%	FRUITS & LEGUMES	%	POISSONS	%	GLACE	%	DIVERS	%
SUD	**71**	**18,35%**	**287209**	**21,18%**	**61164**	**21,57%**	**2110**	**33,60%**	**40105**	**17,46%**	**15421**	**68,53%**	**1211**	**36,07%**	**2817**	**11,74%**
AGADIR	38	9,82%	192955	14,23%	35783	12,52%	2046	32,58%	25155	10,95%	7901	35,11%	456	13,58%	225	0,94%
LAAYOUNE	5	1,29%	3430	0,25%	1035	0,36%					780	3,47%	255	7,60%		
OUARZAZATE	6	1,55%	10522	0,78%	2429	0,85%	12	0,19%	2400	1,04%					17	0,07%
TAN TAN	8	2,07%	21236	1,57%	7248	2,54%	8	0,13%			5740	25,95%	500	14,89%		
TAROUDANT	13	3,36%	58909	4,34%	15125	5,29%			12550	5,46%					2575	10,73%
TIZNIT	1	0,26%	157,00	0,01%	44,00	0,02%	44	0,70%								
TENSIFT	**28**	**7,24%**	**30351**	**2,24%**	**7210**	**2,52%**	**213**	**3,39%**	**2353**	**1,02%**	**2891**	**12,85%**	**1276**	**38,01%**	**477**	**1,99%**
ESSAOUIRA	3	0,78%	1470	0,11%	413	0,14%	13	0,21%			300	1,33%	100	2,98%		
MARRAKECH	13	3,36%	16227	1,20%	3339	1,17%	100	1,59%	1912	0,83%	100	0,44%	750	22,34%	477	1,99%
SAFI	12	3,10%	12654	0,93%	3458	1,21%	100	1,59%	441	0,19%	2491	11,07%	426	12,69%		
CENTRE	**150**	**38,76%**	**445416**	**32,85%**	**92288**	**32,29%**	**2410**	**38,38%**	**72218**	**31,44%**	**2100**	**9,33%**	**128**	**3,81%**	**15432**	**64,30%**
BENI MELLAL	4	1,03%	13411	0,99%	3301	1,15%	31	0,49%	3000	1,31%					270	1,13%
BENSLIMANE	3	0,78%	16895	1,25%	4340	1,52%			4300	1,87%					40	0,17%
CASABLANCA	117	30,23%	359967	26,55%	71839	25,13%	1845	29,38%	53168	23,15%	2070	9,20%	108	3,22%	14548	61,04%
EL JADIDA	14	3,62%	27565	2,03%	6064	2,12%			5570	2,42%			20	0,60%	474	1,98%
KHOURIBGA	2	0,52%	1362	0,10%	38	0,01%	38	0,61%								
MOHAMMEDIA	5	1,29%	8184	0,60%	2000	0,70%	20	0,32%	1950	0,85%	30	0,13%				
SETTAT	5	1,29%	18011	1,33%	4706	1,65%	476	7,58%	4230	1,84%						
NORD OUEST	**61**	**15,76%**	**153585**	**11,33%**	**33046**	**11,56%**	**326**	**5,19%**	**25567**	**11,13%**	**1978**	**8,79%**	**335**	**9,98%**	**4840**	**20,17%**
KENITRA	8	2,07%	20120	1,48%	4651	1,63%	10	0,16%	3018	1,31%	3	0,01%	70	2,09%	1550	6,46%
KHEMISSET	4	1,03%	16389	1,21%	3638	1,27%	28	0,45%	3610	1,57%						
LARACHE	6	1,5[illegible]6	31046	2,29%	7630	2,67%			7400	3,22%	120	0,53%	110	3,28%		
RABAT-SALE	8	2,07%	19815	1,46%	4058	1,42%	123	1,96%	3700	1,61%	90	0,40%	12	0,36%	133	0,55%
SIDI KACEM	2	0,52%	1620	0,12%	406	0,14%			400	0,17%			6	0,18%		
TANGER	11	2,84%	24847	1,83%	4664	1,63%	104	1,66%	3045	1,33%	68	0,30%	70	2,09%	1377	5,74%
TEMARA-SKHIRAT	9	2,33%	31360	2,31%	6084	2,13%	19	0,30%	4365	1,90%					1700	7,08%
TETOUAN	13	3,36%	8388	0,62%	1915	0,67%	42	0,67%	29	0,01%	1697	7,54%	67	2,00%	80	0,33%
CENTRE NORD	**15**	**3,88%**	**79778**	**5,88%**	**16336**	**5,71%**	**816**	**12,99%**	**15000**	**6,53%**			**250**	**7,45%**	**270**	**1,13%**
AL HOCEIMA	1	0,26%	1200,00	0,09%	200,00	0,07%							200,00	5,96%		
FES	13	3,36%	78298	5,77%	16106	5,63%	786	12,52%	15000	6,53%			50	1,49%	270	1,13%
TAZA	1	0,26%	280,00	0,02%	30,00	0,01%	30	0,48%								
ORIENTAL	**21**	**5,43%**	**83216**	**6,14%**	**17145**	**6,00%**	**46**	**0,73%**	**16721**	**7,28%**	**98**	**0,44%**	**127**	**3,78%**	**153**	**0,64%**
BERKANE	7	1,81%	71640	5,28%	14702	5,14%			14700	6,40%			2	0,06%		
NADOR	7	1,81%	10485	0,77%	2262	0,79%	21	0,33%	2021	0,88%	95	0,42%	125	3,72%		
OUJDA	7	1,81%	1091	0,08%	181	0,06%	25	0,40%			3	0,01%			153	0,64%
CENTRE SUD	**41**	**10,59%**	**276396**	**20,38%**	**58162**	**20,35%**	**359**	**5,72%**	**57750**	**25,14%**	**13**	**0,06%**	**30**	**0,89%**	**10**	**0,04%**
EL HAJEB	17	4,39%	137100	10,11%	27900	9,76%			27900	12,15%						
ERRACHIDIA	3	0,78%	14554	1,07%	2850	1,00%			2840	1,24%					10	0,04%
IFRANE	7	1,81%	41884	3,09%	8778	3,07%	15	0,24%	8750	3,81%	13	0,06%				
KHENIFRA	5	1,29%	30058	2,22%	6814	2,38%	14	0,22%	6800	2,96%						
MEKNES	9	2,33%	52800	3,89%	11820	4,14%	330	5,25%	11460	4,99%			30	0,89%		
TOTAL GENERAL	**387**	**100,00%**	**1355951**	**100,00%**	**285851**	**100,00%**	**6280**	**100,00%**	**229714**	**100,00%**	**22501**	**100,00%**	**3357**	**100,00%**	**23999**	**100,00%**

RI PARTITION DE LA CAPACITE DES UNITES UTILISATRICES DE FROID ENTRE L'ETAT ET LE PRIVE

Tableau n° 4

REGION ECONOMIQUE / PROVINCE	Nbre UNITES	CAPACITE en T	% CAPACITE	ETAT CAPACITE en T	ETAT EN % /TOTAL MAROC	ETAT PART ETAT	PRIVE CAPACITE en T	PRIVE EN % /TOTAL MAROC	PRIVE PART ETAT
SUD	71	61 664	21,57%	20 480	21,98%	7,16%	41 184	21,37%	14,41%
AGADIR	38	35 783	12,52%	15 046	16,15%	5,26%	20 737	10,76%	7,25%
LAAYOUNE	5	1 035	0,36%	270	0,29%	0,09%	765	0,40%	0,27%
OUARZAZATE	6	2 429	0,85%	2 412	2,59%	0,84%	17	0,01%	0,01%
TAN TAN	8	7 248	2,54%	208	0,22%	0,07%	7 040	3,65%	2,46%
TAROUDANT	13	15 125	5,29%	2 500	2,68%	0,87%	12 625	6,55%	4,42%
TIZNIT	1	44	0,02%	44	0,05%	0,02%	0	0,00%	0,00%
TENSIFT	28	7 210	2,52%	2 238	2,40%	0,78%	4 972	2,58%	1,74%
ESSAOUIRA	3	413	0,14%	13	0,01%	0,00%	400	0,21%	0,14%
MARRAKECH	13	3 339	1,17%	2 125	2,28%	0,74%	1 214	0,63%	0,42%
SAFI	12	3 458	1,21%	100	0,11%	0,03%	3 358	1,74%	1,17%
CENTRE	150	92 288	32,29%	42 455	45,57%	14,85%	49 833	25,86%	17,43%
BENI MELLAL	4	3 301	1,15%	31	0,03%	0,01%	3 270	1,70%	1,14%
BENSLIMANE	3	4 340	1,52%		0,00%	0,00%	4 340	2,25%	1,52%
CASABLANCA	117	71 839	25,13%	40 950	43,95%	14,33%	30 889	16,03%	10,81%
EL JADIDA	14	6 064	2,12%	920	0,99%	0,32%	5 144	2,67%	1,80%
KHOURIBGA	2	38	0,01%	38	0,04%	0,01%	0	0,00%	0,00%
MOHAMMEDIA	5	2 000	0,70%	40	0,04%	0,01%	1 960	1,02%	0,69%
SETTAT	5	4 705	1,65%	476	0,51%	0,17%	4 230	2,20%	1,48%
NORD OUEST	61	33 046	11,55%	8 393	9,01%	2,94%	24 653	12,79%	8,62%
KENITRA	8	4 651	1,63%	13	0,01%	0,00%	4 638	2,41%	1,62%
KHEMISSET	4	3 638	1,27%	28	0,03%	0,01%	3 610	1,87%	1,26%
LARACHE	6	7 630	2,67%	5 000	5,37%	1,75%	2 630	1,36%	0,92%
RABAT-SALE	8	4 058	1,42%	123	0,13%	0,04%	3 935	2,04%	1,38%
SIDI KACEM	2	405	0,14%		0,00%	0,00%	406	0,21%	0,14%
TANGER	11	4 664	1,63%	3 144	3,37%	1,10%	1 520	0,79%	0,53%
TEMARA-SKHIRAT	9	6 084	2,13%	19	0,02%	0,01%	6 065	3,15%	2,12%
TETOUAN	13	1 915	0,67%	66	0,07%	0,02%	1 849	0,95%	0,65%
CENTRE NORD	15	16 336	5,71%	5 466	5,87%	1,91%	10 870	5,64%	3,80%
AL HOCEIMA	1	200	0,07%		0,00%	0,00%	200	0,10%	0,07%
FES	13	16 106	5,63%	5 436	5,83%	1,90%	10 670	5,54%	3,73%
TAZA	1	30	0,01%	30	0,03%	0,01%	0	0,00%	0,00%
ORIENTAL	21	17 145	6,00%	6 049	6,49%	2,12%	11 096	5,76%	3,88%
BERKANE	7	14 702	5,14%	6 000	6,44%	2,10%	8 702	4,52%	3,04%
NADOR	7	2 262	0,79%	21	0,02%	0,01%	2 241	1,16%	0,78%
OUJDA	7	181	0,06%	28	0,03%	0,01%	153	0,08%	0,05%
CENTRE SUD	41	58 162	20,35%	8 089	8,68%	2,83%	50 073	25,99%	17,52%
EL HAJEB	17	27 900	9,75%	2 500	2,68%	0,87%	25 400	13,18%	8,89%
ERRACHIDIA	3	2 850	1,00%	2 000	2,15%	0,70%	850	0,44%	0,30%
IFRANE	7	8 778	3,07%	15	0,02%	0,01%	8 763	4,55%	3,07%
KHENIFRA	5	6 814	2,38%	14	0,02%	0,00%	6 800	3,53%	2,38%
MEKNES	9	11 820	4,14%	3 560	3,82%	1,25%	8 260	4,29%	2,89%
TOTAL GENERAL	387	285 851	100,00%	93 170	100,00%	32,59%	192 681	100,00%	67,41%

171

SECTEUR DE LA CONGELATION ET SURGELATION

Tableau n° 5

PROVINCE	CAP. CONGELATION ET SURGELATION		ETAT		PRIVE	
	(T/J)	%	CAP. (T/J)	%	CAP. (T/J)	%
AGADIR	387	18,14%	4	0,54%	383	27,51%
BERKANE	15	0,70%	0	0,00%	15	1,08%
CASABLANCA	524	24,57%	320	43,18%	204	14,66%
EL JADIDA	20	0,94%	0	0,00%	20	1,44%
ERRACHIDIA	1	0,05%	0	0,00%	1	0,07%
ESSAOUIRA	10	0,47%	3	0,40%	7	0,50%
FES	40	1,88%	40	5,40%	0	0,00%
KENITRA	130	6,09%	0	0,00%	130	9,34%
KHEMISSET	3	0,14%	3	0,40%	0	0,00%
KHENIFRA	4	0,19%	4	0,54%	0	0,00%
LAAYOUNE	150	7,03%	0	0,00%	150	10,78%
LARACHE	48	2,25%	0	0,00%	48	3,45%
MARRAKECH	45	2,11%	45	6,07%	0	0,00%
MOHAMMEDIA	16	0,75%	2	0,27%	14	1,01%
NADOR	35	1,64%	0	0,00%	35	2,51%
RABAT-SALE	63	2,95%	13	1,75%	50	3,59%
SAFI	64	3,00%	15	2,02%	49	3,52%
SETTAT	29	1,36%	5	0,67%	24	1,72%
TAN TAN	169	7,92%	0	0,00%	169	12,14%
TANGER	19	0,89%	1	0,13%	18	1,29%
TAROUDANT	270	12,66%	270	36,44%	0	0,00%
TEMARA-SKHIRAT	36	1,69%	4	0,54%	32	2,30%
TETOUAN	54	2,53%	11	1,48%	43	3,09%
TIZNIT	1	0,05%	1	0,13%	0	0,00%
TOTAL GENERAL	**2133**	**100,00%**	**741**	**100,00%**	**1392**	**100,00%**

CLASSIFICATION DES UNITES UTILISATRICES DU FROID PAR CLASSE DE CAPACITE (TONNES) AU NIVEAU NATIONAL

Tableau n° 7

	CLASSE 1 0<C<100	CLASSE 2 100<C<500	CLASSE 3 500<C<1000	CLASSE 4 1000<C<2000	CLASSE 5 2000<C<5000	CLASSE 6 C>5000	TOTAL NATION
NOMBRE UNITES	188	75	27	37	51	9	
NOMBRE CUMULE D'UNITES	188	263	290	327	378	387	
CAPACITE GLOBALE DE CHAQUE CLASSE (T)	4486	16153	18463	50586	129655	66508	285
CAP. MOYENNE DE LA CLASSE (T)	23,86	215,37	683,81	1367,19	2542,25	7389,78	73
CUMUL CAPACITE GLOBALE (T)	4486	20639	39102	89688	219343	285851	285
CUMUL CAPACITE En %	1,57%	7,22%	13,68%	31,38%	76,73%	100,00%	100,

EVOLUTION DES QUANTITES ENTREPOSEES
PAR PROVINCE ET PAR REGION ECONOMIQUE
1990 - 1993 (EN TONNES)

REGION ECONOMIQUE / PROVINCE	Nbre UNITES	CAPACITE en T	QUANTITES ENTREPOSEES 90	%	91	%	92	%	93	%
SUD	71	61 664	173 746	27,29%	247 041	31,34%	238 551	30,72%	183 855	26,28%
AGADIR	38	35 783	135 964	21 52%	202 636	25,71%	188 [illegible]	24 40%	143 974	20 58%
LAAYOUNE	5	1 035	0	0 00%	0	0 00%	[illegible]	0 00%	515	0 07%
OUARZAZATE	6	2 429	3 062	0 48%	3 807	0 48%	[illegible]	0 40%	3 543	0 41%
TAN TAN	8	7 248	26 050	4 09%	32 900	4 17%	33 [illegible]	4 39%	24 [illegible]	3 45%
TAROUDANT	13	15 125	5 300	0 83%	5 358	0 68%	5 [illegible]	0 76%	12 056	[illegible]
TIZNIT	1	44	2 370	0 37%	2 340	0 30%	2 [illegible]	0 27%	227	[illegible]
TENSIFT	28	7 210	23 587	3,71%	24 542	3,11%	24 871	3,20%	14 907	2,13%
ESSAOUIRA	3	413	2 560	0 42%	2 231	0 28%	1 [illegible]	0 21%	395	0 06%
MARRAKECH	13	3 339	20 307	3 19%	21 261	2 70%	22 [illegible]	2 85%	12 812	1 83%
SAFI	12	3 458	600	0 09%	1 050	0,13%	1 [illegible]	0 14%	1 700	0 24%
CENTRE	150	92 288	238 095	37,40%	295 379	37,47%	281 759	36,29%	271 787	38,85%
BENI MELLAL	4	3 301	2 500	0 39%	150	0 02%	0	0 00%	0	0 00%
BENSLIMANE	3	4 340	0	0 00%	1 600	0 20%	1 500	0 21%	1 500	0 23%
CASABLANCA	117	71 839	216 816	34 06%	255 121	32 49%	235 [illegible]	30 78%	231 593	33 11%
EL JADIDA	14	6 064	15 890	2 50%	34 640	4 39%	35 850	4 62%	29 011	4 15%
KHOURIBGA	2	38	0	0 00%	0	0 00%	0	0 00%	0	0 00%
MOHAMMEDIA	5	2 000	502	0 08%	808	0 10%	1 [illegible]	0 14%	5 545	0 81%
SETTAT	5	4 706	2 387	0 37%	2 050	0 26%	4 [illegible]	0 54%	3 837	0 55%
NORD OUEST	61	33 046	129 728	20,38%	134 449	17,06%	138 304	17,81%	125 245	17,90%
KENITRA	8	4 651	8 616	1,35%	7 906	1 00%	10 [illegible]	1 39%	10 578	1 57%
KHEMISSET	4	3 638	3 524	0 55%	3 903	0 50%	3 429	0 44%	2 738	0 39%
LARACHE	6	7 630	3 365	0,53%	5 498	0 70%	5 304	0 68%	5 147	0 74%
RABAT-SALE	8	4 058	11 500	1 81%	14 480	1 84%	14 790	1 90%	14 [illegible]	[illegible]
SIDI KACEM	2	406	0	0,00%	0	0 00%	0	0 00%		[illegible]
TANGER	11	4 664	12 952	2 03%	13 055	1 66%	12 [illegible]	1 59%	11 [illegible]	1 65%
TEMARA-SKHIRAT	9	6 084	5 867	0 92%	5 165	0 66%	6 500	0 85%	8 [illegible]	1,28%
TETOUAN	13	1 915	83 904	13 18%	84 442	10,71%	85 043	10 95%	71 545	10 23%
CENTRE NORD	15	16 336	12 181	1,91%	15 768	2,00%	17 104	2,20%	15 591	2,23%
AL HOCEIMA	1	200	0	0 00%	0	0 00%	0	0 00%	0	0 00%
FES	13	16 106	11 614	1 82%	15 212	1 93%	16 432	2 12%	14 847	2,12%
TAZA	1	30	567	0 09%	556	0 07%	672	0 09%	744	0 11%
ORIENTAL	21	17 145	14 070	2,21%	18 058	2,29%	18 698	2,41%	23 021	3,29%
BERKANE	7	14 702	11 740	1,84%	15 638	1,98%	16 298	2 10%	19 952	2 85%
NADOR	7	2 262	1 710	0,27%	1 740	0,22%	1 540	0 20%	1 762	0 25%
OUJDA	7	181	620	0 10%	680	0 09%	850	0 11%	1 307	0 19%
CENTRE SUD	41	58 162	45 175	7,10%	53 044	6,73%	57 163	7,36%	65 262	9,33%
EL HAJEB	17	27 900	17 935	2 82%	20 916	2 65%	20 955	2 70%	24 279	3 47%
ERRACHIDIA	3	2 850	5 963	0 94%	7 635	0 97%	8 790	1 13%	9 970	1 42%
IFRANE	7	8 778	9 100	1 43%	10 250	1,30%	12 200	1 57%	14 290	2 04%
KHENIFRA	5	6 814	3 945	0,62%	3 969	0 50%	4 355	0 57%	5 600	0 80%
MEKNES	9	11 820	8 232	1,29%	10 274	1,30%	10 819	1 39%	11 123	1 59%
TOTAL GENERAL	387	285 851	636 582	100,00%	788 281	100,00%	776 450	100,00%	699 668	100,00%

MAIN D'OEUVRE UTILISEE PAR LES UNITES UTILISATRICES DU FROID
PAR PROVINCE ET PAR REGION ECONOMIQUE

REGION ECONOMIQUE / PROVINCE	Nbre UNITES	CADRES TECH.	CADRES ADMIN.	CADRES TOTAL	Tonnes/ Cadre	MAIN D'OEUVRE PERMANENTE QUALIF.	MAIN D'OEUVRE PERMANENTE NON QUALIF.	MAIN D'OEUVRE PERMANENTE TOTAL	Tonnes Ouvrier	M.O.S Frigo
SUD	**71**	**100**	**123**	**223**	**277**	**136**	**738**	**874**	**71**	**53614**
AGADIR	38	48	78	126	284	98	566	[illegible]	[illegible]	[illegible]
LAAYOUNE	5	2	5	7	146	0	5	[illegible]	[illegible]	[illegible]
OUARZAZATE	6	2	8	10	243	11	11	[illegible]	[illegible]	[illegible]
TAN TAN	8	29	24	53	137	6	130	[illegible]	[illegible]	[illegible]
TAROUDANT	13	18	8	25	582	21	25	[illegible]	[illegible]	[illegible]
TIZNIT	1	1	0	1	44	0	1	[illegible]	[illegible]	[illegible]
TENSIFT	**28**	**39**	**32**	**71**	**102**	**20**	**35**	**55**	**131**	**19070**
ESSAOUIRA	3	4	2	6	69	1	0	[illegible]	[illegible]	[illegible]
MARRAKECH	13	18	16	34	98	13	14	[illegible]	[illegible]	[illegible]
SAFI	12	17	14	31	112	6	21	[illegible]	[illegible]	[illegible]
CENTRE	**150**	**99**	**170**	**269**	**343**	**234**	**145**	**379**	**244**	**29614**
BENI MELLAL	4	5	1	6	550	5	0	[illegible]	[illegible]	[illegible]
BENSLIMANE	3	0	0	0	0	0	2	[illegible]	[illegible]	[illegible]
CASABLANCA	117	60	135	195	367	206	120	[illegible]	[illegible]	[illegible]
EL JADIDA	14	20	19	39	155	12	17	[illegible]	[illegible]	[illegible]
KHOURIBGA	2	3	2	5	8	0	0	[illegible]	[illegible]	[illegible]
MOHAMMEDIA	5	5	7	12	167	6	1	[illegible]	[illegible]	[illegible]
SETTAT	5	6	5	11	428	5	5	[illegible]	[illegible]	[illegible]
NORD OUEST	**61**	**94**	**74**	**168**	**197**	**173**	**252**	**425**	**78**	**178660**
KENITRA	8	9	6	15	310	13	1	[illegible]	[illegible]	[illegible]
KHEMISSET	4	6	5	11	331	6	8	[illegible]	[illegible]	[illegible]
LARACHE	6	13	15	28	273	1	3	[illegible]	[illegible]	[illegible]
RABAT-SALE	8	13	5	18	225	3	8	[illegible]	[illegible]	[illegible]
SIDI KACEM	2	1	1	2	203	8	3	[illegible]	[illegible]	[illegible]
TANGER	11	22	21	43	108	68	85	[illegible]	[illegible]	[illegible]
TEMARA-SKHIRAT	9	9	8	17	358	15	5	[illegible]	[illegible]	[illegible]
TETOUAN	13	21	13	34	56	59	139	[illegible]	[illegible]	[illegible]
CENTRE NORD	**15**	**26**	**20**	**46**	**355**	**32**	**30**	**62**	**263**	**7660**
AL HOCEIMA	1	2	1	3	67	1	10	[illegible]	[illegible]	[illegible]
FES	13	23	19	42	383	31	18	[illegible]	[illegible]	[illegible]
TAZA	1	1	0	1	30	0	2	[illegible]	[illegible]	[illegible]
ORIENTAL	**21**	**18**	**22**	**40**	**429**	**31**	**32**	**63**	**272**	**13790**
BERKANE	7	8	13	21	700	19	18	[illegible]	[illegible]	[illegible]
NADOR	7	5	4	9	251	11	14	[illegible]	[illegible]	[illegible]
OUJDA	7	5	5	10	18	1	0	[illegible]	[illegible]	[illegible]
CENTRE SUD	**41**	**35**	**44**	**79**	**736**	**52**	**154**	**206**	**282**	**56160**
EL HAJEB	17	17	25	42	664	29	81	[illegible]	[illegible]	[illegible]
ERRACHIDIA	3	2	4	6	475	1	8	[illegible]	[illegible]	[illegible]
IFRANE	7	3	8	11	798	10	10	[illegible]	[illegible]	[illegible]
KHENIFRA	5	6	2	8	852	7	25	[illegible]	[illegible]	[illegible]
MEKNES	9	7	5	12	985	5	30	[illegible]	[illegible]	[illegible]
TOTAL GENERAL	**387**	**411**	**485**	**896**	**319**	**678**	**1386**	**2064**	**138**	**358568**

175

REPARTITION DE LA CAPACITE FRIGORIFIQUE
SELON LES TYPES D'ENTREPOSAGE

Tableau n° 14

REGION ECONOMIQUE / PROVINCE	Nbre UNITES	CAPACITE en T	Nre CHAMBRES EN AT	CAP. en M3 EN AT	CAP. en T EN AT	Nbre CHAMB. En NEGATIF	CAP. en M3 EN POSITIF	CAP. en T EN POSITIF	Nbre CAMB. EN NEGATIF	CAP. en M3 EN NEGATIF	CAP. en T EN NEGATIF
SUD	**71**	**61664**	**6**	**8312**	**2500**	**184**	**220087**	**40653**	**75**	**58810**	**18511**
AGADIR	36	35783	6	8312	2500	93	152914	[illegible]	49	[illegible]	6446
LAAYOUNE	5	1035	0	0	0	8	570	[illegible]	6	2850	755
OUARZAZATE	6	2429	0	0	0	16	10522	[illegible]	0	0	0
TAN TAN	8	7248	0	0	0	13	2788	[illegible]	15	15450	6800
TAROUDANT	13	15125	0	0	0	31	53181	[illegible]	4	5725	2500
TIZNIT	1	44 00	0	0 00	0 00	3	114 00	[illegible]	1	143 00	8 00
TENSIFT	**28**	**7210**	**0**	**0**	**0**	**58**	**16807**	**2952**	**37**	**13544**	**4258**
ESSAOUIRA	3	413	0	0	0	1	250	[illegible]	7	1020	403
MARRAKECH	13	3339	0	0	0	47	14505	[illegible]	4	1621	900
SAFI	12	3458	0	0	0	10	1951	[illegible]	26	10703	2955
CENTRE	**150**	**92288**	**4**	**10000**	**2000**	**549**	**367454**	**72407**	**79**	**67962**	**17881**
BENI MELLAL	4	3301	0	0	0	17	13396	[illegible]	1	13	5
BENSLIMANE	3	4340	0	0	0	17	16885	[illegible]	0	0	0
CASABLANCA	117	71839	4	10000	2000	458	291317	[illegible]	54	58670	15595
EL JADIDA	14	6064	0	0	0	26	22505	[illegible]	4	5050	1320
KHOURIBGA	2	38	0	0	0	5	1382	[illegible]	0	0	-
MOHAMMEDIA	5	2000	0	0	0	9	5715	[illegible]	5	2489	4
SETTAT	5	4706	0	0	0	17	16281	[illegible]	5	1750	595
NORD OUEST	**61**	**33046**	**3**	**4200**	**1000**	**142**	**120233**	**25436**	**64**	**29152**	**6560**
KENITRA	8	4551	0	0	0	18	15935	[illegible]	3	4185	730
KHEMISSET	4	3638	3	4200	1000	13	12085	[illegible]	1	104	3
LARACHE	5	7630	0	0	0	12	20000	[illegible]	24	11045	2630
RABAT-SALE	8	4058	0	0	0	37	19110	[illegible]	5	705	85
SIDI KACEM	2	406	0	0	0	1	1550	[illegible]	1	50	6
TANGER	11	4664	0	0	0	27	24258	[illegible]	4	589	82
TEMARA-SKHIRAT	9	5084	0	0	0	21	24575	[illegible]	5	6682	1329
TETOUAN	13	1915	0	0	0	13	2507	[illegible]	17	5751	1595
CENTRE NORD	**15**	**16336**	**2**	**3304**	**800**	**93**	**75034**	**15246**	**3**	**1440**	**290**
AL HOCEIMA	1	200 00	0	0 00	0 00	0	0 00	[illegible]	1	1200 00	200 00
FES	13	16106	2	3304	800	92	74754	[illegible]	2	240	90
TAZA	1	30 00	0	0 00	0 00	1	280 00	[illegible]	0	0 00	0 00
ORIENTAL	**21**	**17145**	**3**	**2835**	**750**	**62**	**75335**	**15373**	**10**	**5046**	**1022**
BERKANE	7	14702	3	2835	750	29	64119	[illegible]	5	4555	802
NADOR	7	2262	0	0	0	21	10125	[illegible]	5	350	220
OUJDA	7	181	0	0	0	12	1091	[illegible]	0	0	0
CENTRE SUD	**41**	**58162**	**5**	**7000**	**1400**	**260**	**268648**	**56716**	**4**	**748**	**46**
EL HAJEB	17	27900	5	7000	1400	103	130100	[illegible]	0	0	0
ERRACHIDIA	3	2850	0	0	0	10	14554	[illegible]	0	0	0
IFRANE	7	8778	0	0	0	39	41818	[illegible]	2	66	12
KHENIFRA	5	6814	0	0	0	25	29506	[illegible]	1	552	4
MEKNES	9	11820	0	0	0	83	52670	[illegible]	1	130	30
TOTAL GENERAL	**387**	**285851**	**23**	**35651**	**8450**	**1349**	**1143598**	**228833**	**272**	**176702**	**48508**

ANNEX 12

RESEARCH TOPICS AT THE I.A.V. AND DPVCTRF NURSERY AND PLANT CONTROL PROCUEDURES

I. I.A.V. Research Topics

- Plant propagation techniques ranging from conventional seeds, cuttings, grafting and tissue culture.
- *In vitro* virus elimination of fruit plants
- Varietal and rootstock testing and evaluation
- Chilling requirements of various species and cultivars
- The use of growth regulators in fruit production to:
  - overcome lack of chilling
  - thinning
  - prevent preharvest drop
  - improve fruit size
- Irrigation systems and water management
- Methods to determine optimal harvest date
- Post harvest physiology and storage
- Harvesting and handling
- Marketing
- Pruning and training systems
- Soil fertility and mineral nutrition
- Flowering and fruit development
- Fruit growth and ripening
- Pest and disease control
- Integrated pest management
- Processing

II. DPVCTRF Procedures for Nursery Control and Certification

Inspection Request. The nurseryman must fill out a request form which is sent to the nearest "Inspection Regionale de la Protection de Végétaux". The request must be complete and contain all information pertaining to:

- Name and address of the nurseryman
- Location of nursery
- Species and varieties of grafted plants
- Species and varieties of rootstock
- Quantities of varieties and rootstocks
- Acreage for each variety

Inspection. The nurseryman is also required to establish, at the time of grafting, a map of the nursery in which plots and varieties are labeled. Field plots must be numbered and the names of varieties occupying each plot clearly indicated.

177

The inspection is done:

- At least twice during the growing season (beginning\full growth of grafts)
- Once when plants are dug and are ready for sale and shipment

The inspection includes:

- The equipment used for grafting, irrigation, plant and soil treatment
- Chemicals used to treat plants, soil, and tools
- The varieties
- Phytosanitary conditons
- Mother plants of seeds, bud, or cuttings
- Examination of plants for viruses, bacterial diseases or mycoplasma, insects
- Examination of soil for insects and nematodes

At each visit, an inspection card is established in which the following is specified:

- Names of varieties and rootstocks
- Quantities
- Observations on depredators
- Recommendations regarding treatments to be carried out by the nurseryman

One copy is given to the nurseryman and another is kept by the inspector for filing.

Insects:

- The "capnode noir" (*Capnodis tenebrionis*) for stone fruits
- The "petite mineuse" (peach twig borer *Anarsia lineatella*) for stone fruits
- The "phylloxera" (*Daktulosphaira vitifoliae*) for grapes
- The "pou de San José" (Scale) (*Quadraspidiotus perniciosus*) for Rosaceous crops, grapes and walnut.
- The "puceron lanigère" (*Eriosoma lanigerum*) for apples
- Shothole borer (*Scolytus rugulosus*) for deciduous tree fruits
- The "tordeuse orientale" of peach (oriental fruit moth *Grapholita molesta*)
- The "zeuzère" (*Zeuzera pyrina*) for apples and pears.

Nematodes:

- The "nématode à galle (*Meloidogyne* spp) for stone fruits

Disease:

- The "mosaique" of apple, almond calico of almond
- The crown gall (*Agrobacterium tumefaciens*) on deciduous tree fruits and grapes
- Brown root rot on strawberry
- Phytophthora crown rot (*Phytophthora cactorum*) on strawberry
- Phytophthora root rot (*Phytophthora cinnamomi*) on avocados
- Verticillium wilt (*Verticillium* spp) on strawberry.

Treatment of Infested Nurseries.

178

Nurseries known to be completely or partially infested by one or more of the pests mentioned above are submitted to special inspection and protocols:

a. Treatment during the growing season of plants infested with San Jose Scale and the "puceron laniger".

b. Dip treatment of plants having brown root and crown rot once they are dug.

c. Sorting and inspection of plants. If one or more pests cited earlier are above designated thresholds, all plants must be burned.

d. During the growing season, eliminate and burn plants infected by peach twig borer (petite mineuse), shothole borer (scolyte), zeuzère, crown gall, nematodes, apple mosaic and almond calico when the rate of infestation is higher than 20%.

e. Burn the entire stock if all or some of the plants are infested with:
- larvae of "capnode noir", phylloxera, or brown root rot of avocado,
- crown gall when the percentage of infected plants exceeds 20%
- nematodes when the percentage of infected plants exceeds 20%

f. Any nursery site determined to be infected with crown gall, nematodes, crown rot, brown root rot of avocados and verticillium wilt of strawberry, will not used for at least 3 years for nursery production of plants known to be susceptible to these pests. If the site was infested with nematodes, soil tests are required before the site can be reactivated for plant propagation.

5. Nursery Inspection Activities for the 1992\93 Growing Season

The following tables indicate the number of nurseries inspected and their location, the types of plants and the specific quantities produced. This information gives a fairly comprehensive overview of the size and geographical distribution of fruit plant nursery production in Morocco.

Table 1. Phytosanitary inspection of 1992/93 plant production. Number of nurseries licensed and quantities of plants inspected.

REGION	Number of Nurseries	Number of Plants
Agadir	7	1,816,760
Azrou	58	4,888,000
Beni Mellal	27	4,331,813
El Kelaa	3	89,242
Fes	16	1,063,160
Kenitra	13	1,718,184
Khemisset	3	65,350
Khenifra	4	197,500
Larache	2	563,600
Marrakech	259	8,977,952
Meknes	96	8,135,150
Nador	24	690,000
Oujda	30	1,197,527
Rabat	8	3,617,500
Sidi Kacem	7	621,000
Tanger	26	1,897,470
Taza	7	3,102,536
Total	590	42,973,244

Table 2. Phytosanitary inspection of 1992/93 plant production. Numbers, by type, of fruit plants inspected in different areas of Morocco.

REGION	Citrus	Rosaceous	Olive	Grape
Agadir	1,703,500	100,860		
Azrou		4,779,000		
B. Mellal	52,700	324,243	1,002,000	200
El Kelaa	600	56,700	1,000	
Fes		268,660	708,500	
Kenitra	619,000	523,100	290,000	
Khemisset	1,400	21,750	5,000	
Khenifra		166,500	30,000	1,000
Larache			110,000	
Marrakech	2,243,900	2,827,976	2,753,176	86,815
Meknes	400	1,057,539	6,033,761	1,038,000
Nador	29,000	36,500	577,000	26,000
Oujda	162,600	166,527	727,500	140,900
Rabat	360,000	17,600		1,000
Sidi Kacem		392,800	127,000	
Tanger	127,200	328,750	130,600	
Taza		216,200	112,648	
Total	**5,300,300**	**11,284,705**	**12,608,585**	**1,293,915**

The major limitation to developing large-scale nursery plant certification programs for the fruit industry is the lack of nuclear, virus-free screenhouse collections of major cultivars for propagation and distribution. Progress in this process is most evident in almonds. In addition to almonds, the status of the development of this critical program for several fruit crop groups is described below:

Almond

1. Evaluation of phytosanitary state of mother plants
Mother plants stock at the PEPIMA nursery (Pepiniere Moyen Atlas) and some clones at the INRA Experimental station at Errachidia were checked using ELISA (enzyme linked immunosorbant assay) for two viruses: Prunus Dwarf Virus (PDV) and Prunus Necrotic Ring Spot Virus (PNRV). The results of these tests are shown in Table 1.

Table 3. Results of ELISA tests on almond plants from PEPIMA and INRA.

Location	Number of plants tested	Number of plants infected	Rate of infection (%)
PEPIMA	491	92	19
INRA Errachidia	11	3	27

Trees that were ELISA negative were then tested on peach GF 305, an indicator plant. Results of this biological index are listed in Table 2.

Table 4. Results of bilological index of almond plants on indicator peach GF 305.

Location	Number of plants tested	Number of plants infected	Rate of infection (%)
PEPIMA	264	44	17
INRA	8	0	0

In 1993, the PEPIMA nursery declared 30,000 plants of almond for certification. Given the above information, as many as 5,100-5,700 plants released may be infected with virus. While this rate of virus infection is unacceptable by commercial standards and could cripple the industry it seeks to establish, this organization is just beginning a program by which nuclear virus-free foundation stock is maintained for commercial propagation.

2. Establishment of a nuclear collection of virus-free almond cultivars
A number of cultivars have been tested for viruses and are being kept in the screenhouse at the Service. Thus far the nuclear screenhouse program includes the varieties Marcona, Fournat, Desmayo Largueta, Ferragnes, Ferraduel and the rootstock peach x almond hybrid GF 677. This nuclear plant material will be used for the production of mother plants stock for propagation of certified plants.

3. Propagation of virus-free plants from the SCSP nuclear collection

In order to enlarge the nuclear collection of virus free material of the SCSP and to initiate the production of certified almond plants, all the virus free cultivars in the screenhouse were propagated. The number of plants propagated are listed in Table 3. The varieties were propagated by grafting on GF 677, the latter being propagated by cuttings.

Table 5. Number of virus free almond plants propagated by the SCSP from screenhouse nuclear stock in 1993.

Cultivars	Number of Plants
Marcona	150
Fournat	274
Ferragnes	226
Ferraduel	151
Rootsock GF 677	2,100

Apricot

The service is planning to initiate a program, starting in 1994, for the identification and propagation of virus free plant material for the propagation of certified plants. The location and cooperating organizations have been selected. The SCSP is planning to work with SO.DE.A and the Menara-INRA Experimental Station in Marrakech on this project. The choice of this location is based on its regional importance for apricot culture. The two varieties chosen for propagation are Canino and Maoui.

Grapes

The established protocols (Reglement Technique) for the production, control, handling, storage and certification of grape plant material has been published (homologué) by the MAMVA since 1989. However, the certification process has yet to be truly implemented. The delay is for the same reason as for other fruit crops - there are no nuclear stocks of true-to-type and virus free plant material.

Strawberry

Within Morocco, certification in 1993 was for 8 hectares of plant production estimated to produce 5,537,600 certified plants. Of that amount, 25% were for foundation stock (Plants de base) and 75% were for certified planting stock. Varieties are discussed in detail in the section on strawberry production.

Fruit Trees: General Production and Prices

Thus, in Morocco, there is really no production of certified plants. The protocols are available but their implementation requires the establishment of true to type and virus free nuclear stock. The nurseries produce plants that are given a cursory inspection by the

Service de la Protection des Vegetaux for major diseases and are then usually declared as "common plants" (plants commun ou tout venant).

Fruit tree nursery prices vary according to availability and demand. Examples of comparative prices among fruit tree species produced in Morocco by SO.DE.A. are listed in Table 4. For example, the high price of cherry plants is due to high demand for plants, especially by small growers of 1 to 5 hectares in the Azrou Immouzzer and Ain Leuh areas where increasing acreages are planted every year. High demand for plants and expansion of cherry plantings can be explained by the increase in demand for local market fruit and by their low cost production of . Cherry has gained the reputation of being the tree of the poor as it requires less care and has a guaranteed market. Most smaller growers sell the crop on the tree and do not have to deal with harvest and marketing problems.

Table 6. Price of fruit tree plants sold by SO.DE.A. in 1993.

Species	Price (Dh)
Cherry	35
Apple	18
Pear	16
Quince	14
Loquat	17
Peach	10
Almond	8
Grapes	10

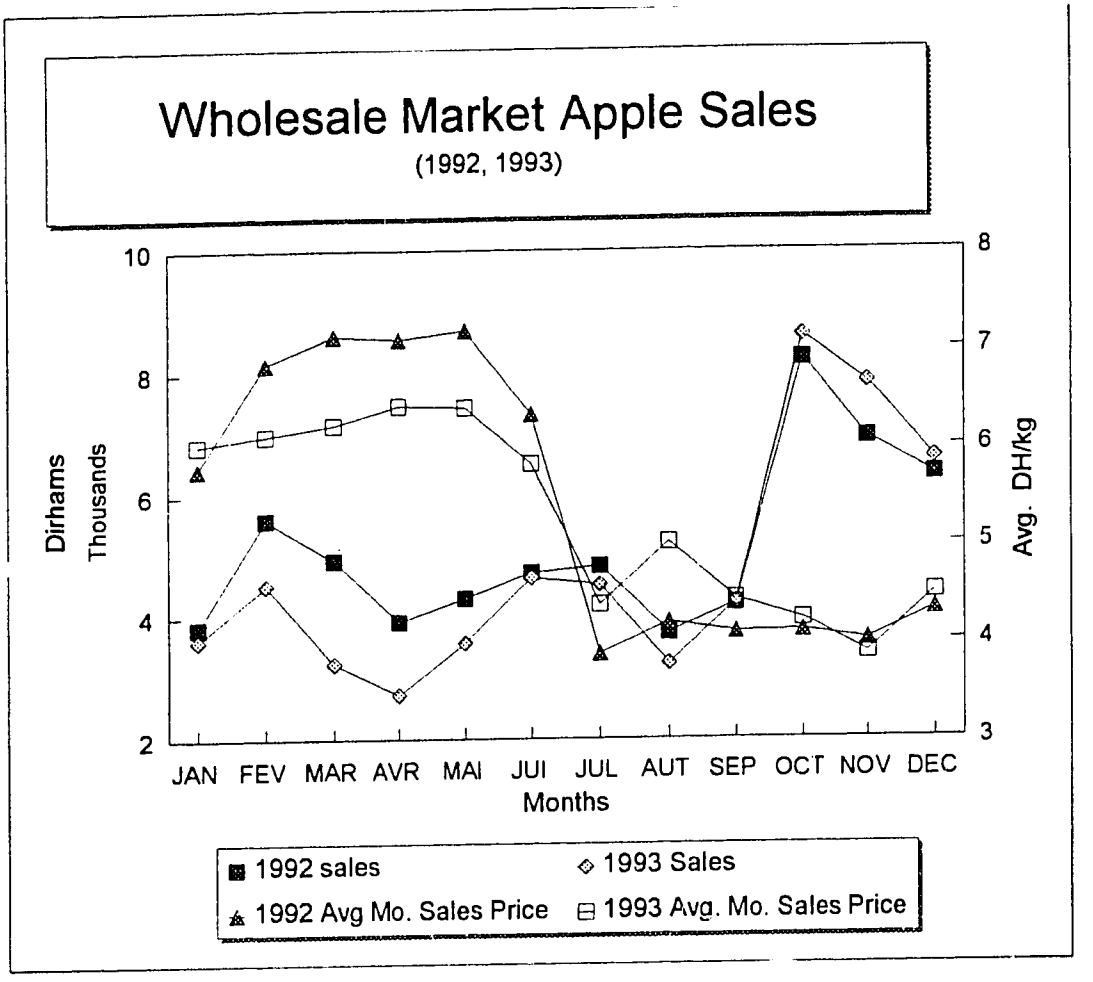
SO.DE.A.'s crop of three hectares of cherry trees was sold this year for $35,000 US. Another reason for the high price of these cherry plants could be due to the fact that SODEA uses as a rootstock (Sainte Lucie [*Prunus mahaleb*] imported from France at a cost of 6 Dh each. Cherry plants at other nurseries (suckers used as rootstocks) cost from 25 to 30 Dh.

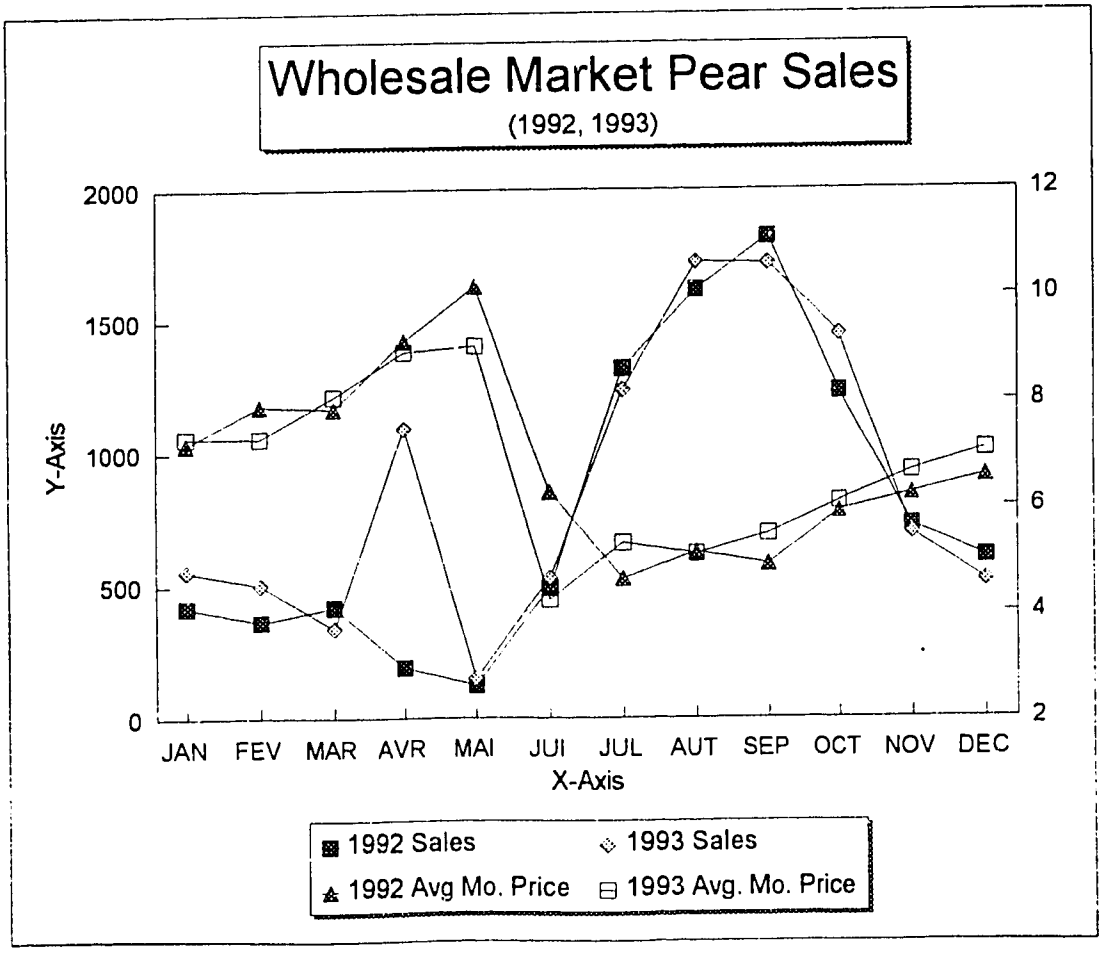
ANNEX THIRTEEN

MOROCCAN EXPORTS OF FRESH FRUITS, BY QUANTITY

PRIX DES POMMES ET POIRES EN DH/KG

	POMMES				POIRES			
	PRIX	var	QUANTITE	var	PRIX	var	QUANTITE	
JAN	5.77		3823.00		7.18		420.00	
FEV	6.85	1.19	5600.00	1.46	7.91	1.10	363.00	0.86
MAR	7.13	1.04	4927.00	0.88	7.85	0.99	419.00	1.15
AVR	7.10	1.00	3914.00	0.79	9.12	1.16	190.00	0.45
MAI	7.18	1.01	4300.00	1.10	10.17	1.12	123.00	0.65
JUI	6.33	0.88	4717.00	1.10	6.26	0.62	490.00	3.98
JUL	3.87	0.61	4824.00	1.02	4.63	0.74	1320.00	2.69
AUT	4.19	1.08	3729.00	0.77	5.14	1.11	1619.00	1.23
SEP	4.09	0.98	4202.00	1.13	4.90	0.95	1819.00	1.12
OCT	4.10	1.00	8223.00	1.96	5.90	1.20	1232.00	0.68
NOV	4.01	0.98	6926.00	0.84	6.23	1.06	726.00	0.59
DEC	4.32	1.08	6327.00	0.91	6.57	1.05	606.00	0.83
			---				---	
			61512.00				9327.00	
JAN 93	6.02	1.39	3611.00	0.57	7.30	1.11	556.00	0.92
FEV 93	6.12	1.02	4527.00	1.25	7.30	1.00	503.00	0.90
MAR 93	6.22	1.02	3233.00	0.71	8.07	1.11	340.00	0.68
AVR 93	6.42	1.03	2729.00	0.84	8.91	1.10	1094.00	3.22
MAI 93	6.40	1.00	3572.00	1.31	9.04	1.01	150.00	0.14
JUI 93	5.82	0.91	4632.00	1.30	4.23	0.47	527.00	3.51
JUL 93	4.37	0.75	4520.00	0.98	5.30	1.25	1240.00	2.35
AUT 93	5.01	1.15	3222.00	0.71	5.10	0.96	1723.00	1.39
SEP 93	4.42	0.88	4219.00	1.31	5.47	1.07	1718.00	1.00
OCT 93	4.22	0.95	8602.00	2.04	6.08	1.11	1449.00	0.84
NOV 93	3.88	0.92	7834.00	0.91	6.66	1.10	698.00	0.48
DEC 93	4.49	1.16	6586.00	0.84	7.06	1.06	517.00	0.74
			---				---	
			57287.00				10515.00	
JAN 94	5.31	1.18	5221.00	0.79	7.44	1.05	412.00	0.80
FEV 94	5.78	1.09	5593.00	1.07	7.97	1.07	357.00	0.87
MAR 94	5.72	0.99	4948.00	0.88	8.87	1.11	203.00	0.57
AVR 94	6.21	1.09	4467.00	0.90	9.86	1.11	109.00	0.54
MAI 94	7.06	1.14	2794 00	0.63	12.53	1.27	23.00	0.21
JUI 94	5.39	0.76	4614.00	1.65	3.65	0.29	423.00	18.39
JUL 94	4.25	0.79	4811.00	1.04	4.50	1.23	1136.00	2.69
AUT 94	4.87	1.15	3557.00	0.74	5.18	1.15	1538.00	1.35
SEP 94	4.27	0.88	4990.00	1.40	5.63	1.09	1421.00	0.92


Wholesale Market Apple Sales
(1992, 1993)
Dirhams
Thousands
Avg. DH/kg
10
8
6
4
2
8
7
6
5
4
3
JAN FEV MAR AVR MAI JUI JUL AUT SEP OCT NOV DEC
Months
1992 sales
1993 Sales
1992 Avg Mo. Sales Price
1993 Avg. Mo. Sales Price


Wholesale Market Pear Sales
(1992, 1993)
Y-Axis
2000
1500
1000
500
0
12
10
8
6
4
2
JAN FEV MAR AVR MAI JUI JUL AUT SEP OCT NOV DEC
X-Axis
1992 Sales
1993 Sales
1992 Avg Mo. Price
1993 Avg. Mo. Price

DU MAROC EN TONNES

PRODUIT	DESTINATION	1993/94 QUANTITE
ABRICOTS		
	A. SEOUDITE	196.6
	E.A.U.	0.2
	KOWEIT	4
	FRANCE	1.4
	COTE D'IVOIRE	0
	QATAR	0.2
	TOTAL	202.4
CERISES		
	A. SEOUDITE	8.9
	E.A.U.	0.4
	KOWEIT	0.3
	QATAR	0.1
	COTE D'IVOIRE	0.8
	TOTAL	10.5
FRAISES		
	AUTRICHE	533
	QATAR	0.1
	SUISSE	12.3
	ALLEMAGNE	179.8
	BELGIQUE	28.1
	ESPAGNE	15.2
	FRANCE	5358.2
	HOLLANDE	17.7
	COTE D'OVOIRE	0.5
	HONGRIE	234.6
	FINLANDE	13.8
	ANGLETERRE	602.4
	TOTAL	6995.7
KUMGUATS		
	ALLEMAGNE	7.7
	ANGLETERRE	5
	FRANCE	11
	TOTAL	23.7
MELON CANTALOUP		
	ALLEMAGNE	3.1
	ANGLETERRE	3.7
	ESPAGNE	16.6
	FRANCE	974.6
	ITALIE	2519.7
	TOTAL	3517.7
MELON GALIA		
	A. SEOUDITE	14.4
	AUTRICHE	7.5
	E.A.U.	1.5
	KOWEIT	0.2
	QATAR	0

151

	TCHECHOSLOVA	0.1
	USA	0.7
	ALLEMAGNE	747.9
	ANGLETERRE	339.2
	BELGIQUE	121.2
	ESPAGNE	699.1
	FRANCE	2812.7
	HOLLANDE	29.9
	ITALIE	63.8
	COTE D'IVOIRE	0
	TOTAL	4846.6
NECTARINES		
	FRANCE	557.4
PASTEQUES		
	TCHECHOSLOVA	0.1
PECHES		
	A. SEOUDITE	1.9
	SUISSE	38.9
	ALLEMAGNE	52.9
	FRANCE	859
	HOLLANDE	1.1
	COTE D'IVOIRE	0.1
	TOTAL	953.9
TOTAL DES FRUITS FRAIS		**16,550.6**