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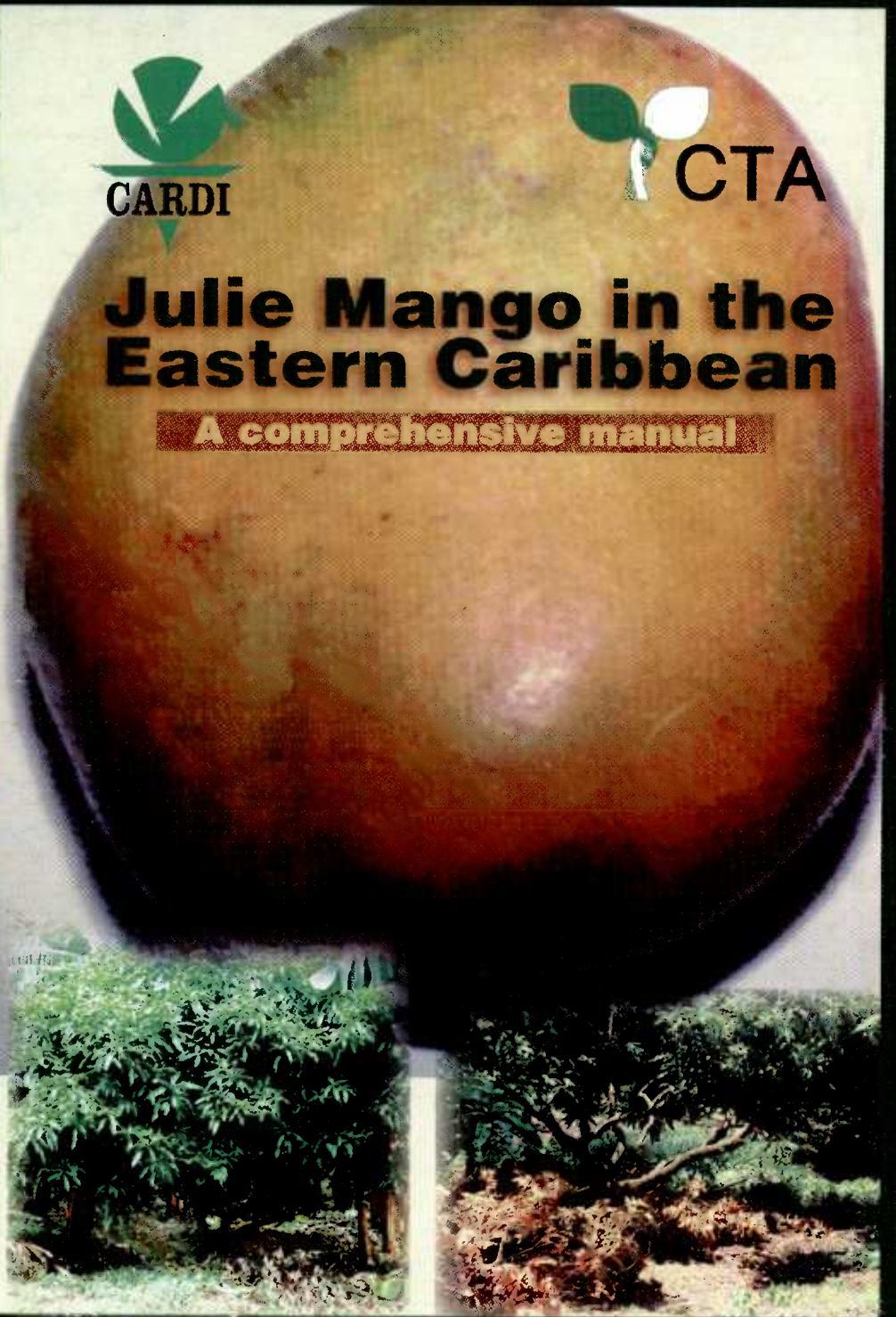
Julie Mango in the Eastern Caribbean

A comprehensive manual



JULIE MANGO
IN THE EASTERN CARIBBEAN

A comprehensive manual

Caribbean Agricultural Research and Development Institute (CARDI)

The Technical Centre for Agricultural and Rural Cooperation (CTA)

November 2001

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The publication of this document was made possible through the kind courtesy of the Technical Centre for Agricultural and Rural Cooperation (CTA).

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ISBN: 976-617-009-6 (pbk)
PSC: DO/001/01

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Photographs

All the photographs are placed in the centre of the manual, for economy in printing.

Acknowledgements

This Julie Mango Manual is the culmination of years of effort. It presents a set of technologies developed for production of the Julie mango in a number of member countries of the Organisation of Eastern Caribbean States (OECS).

We thank the authors of each of the chapters and particularly Mr Gregory Robin for his relentless efforts in coordinating the input of the authors across the region, the editors and the Information and Communication department at CARDI.

Also, we acknowledge Ms Alison Eades and Denyse Johnston for the early work done to prepare the document for publication from its first rough draft in 1996.

Ms Candice Dubarry as desktop publisher supported layout of the document and is responsible for the cover design.

The Julie Mango Manual is one output from the Tree Crops Project funded by the British Development Division in the Caribbean (BDDC) now known as the Department for International Development (DFID).

Funding for the publication of this manual was provided by the ACP-EU Technical Centre for Agricultural and Rural Cooperation (CTA).

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Information Resources Manager
CARDI

Preface

Mango is a very important fruit in the Caribbean. During the season of mango fruit many people in the region consume a large number on a daily basis. The fruits contain extremely high amounts of vitamin A and are very rich in other important nutrients such as calcium, iron, thiamin and vitamin C. In common with many tropical fruits, mango's nutrient composition indicates vast superiority to fruits such as apple, grape and pear which have to be imported into the Caribbean.

Caribbean people not only consume mangoes, but they are very knowledgeable about the various varieties. This knowledge extends to strong views about the rank preference of varieties. Although, to my knowledge, few formal scientific surveys have been done I suspect that most people would rank 'Julie' as the favourite variety.

This manual is a very comprehensive account of all aspects of producing and marketing Julie mango. The various chapters were written by CARDI scientists and their collaborators and were compiled by Gregory Robin of CARDI, Dominica. The writers are giving readers their knowledge gained from mango production and marketing in the OECS countries, but most of the information is readily transferrable to other Caribbean countries.

It is hoped that publication of this manual will stimulate increased production of Julie mango. This will not only improve the nutritional status of Caribbean people but also increase the trade in the commodity with a particular thrust towards extraregional markets.

Last but by no means least, there is potential for a viable processing industry utilising mango. The opportunities include cottage industries and large scale operations. The manual does not overlook these possibilities and the chapter on processing contains much of the information necessary for the entrepreneur who wants to know how to manufacture mango products.

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Introduction

The Exportable Fruit Crops Research and Development Windward Islands Project (EFCP) began in April 1989, initially for three years and was extended to August 1993. Subsequently a second phase ran until August 1996.

The overall objective was to develop regional technical capabilities which, through research, would lead to methods for increasing the potential of exportable fruit crops in the Windward Islands. The crops covered were avocado, coffee, grapefruit, mango, passion fruit, and sapodilla. Activities focused on improved agronomic practices, control of pests and diseases and reducing postharvest losses.

The specific objectives were:

- to develop appropriate methods for the control of pests and diseases.
- to develop economically sound cultural practices which would improve production of quality fruit.
- to introduce disease-free germplasm and evaluate varieties and cultivars for yield and marketability.
- to establish practices aimed at reducing postharvest losses in the field, in transport and by handlers/shippers.
- to publish recommendations arising from research and disseminate these to Ministries of Agriculture.
- to initiate training programmes for technical and professional workers, as part of an outreach programme.

The majority of the funding was provided by the UK Overseas Development Agency (ODA) through the Natural Resources Institute (NRI) and the British Development Division in the Caribbean (BDDC).

Strategically, project research activities were confined to Dominica to build on the research effort initiated by the Ministry of Agriculture Orchard Crop Management and Research programme which was financed by BDDC. Results were to be transferred to other Windward Islands.

Co-operative linkages were established between this project, the Agricultural Diversification Coordinating Unit (ADCU) of the Organisation of Eastern Caribbean States (OECS), the Inter-American Institute for Co-operation in Agriculture (IICA), The University of the West Indies (UWI) and other CARDI projects, to transfer relevant technical findings to the OECS through a series of regional workshops.

Training activities were also mounted in Dominica by the Ministry of Agriculture to train local farmers and extension officers. Specific institutional strengthening activities were effected with the UWI and the Natural Resources Institute (NRI) to upgrade the skills of CARDI's staff.

The USAID-funded West Indies Produce Support Project (TROPRO) with Israeli technical assistance and with collaboration from the Dominica Ministry of Agriculture initially validated and then helped to extend the technologies emerging from the development project.

The major constraints to production and marketing of mango were identified as fruit fly, anthracnose, gall midge, postharvest losses, irregular flowering and fruit set resulting in low productivity. Also, trees were often established in unfavourable agro-ecological zones, and orchards were poorly managed. Attention was focussed solely on Julie mango as this is the mango most commonly grown for export. The main results of the first phase are summarized in Annex 1.

During the second phase of the project, technologies emerging from Phase I - pruning, fertilizer use, fruit fly trapping, application of a rationalized spray programme to control anthracnose, and hot water treatment, were initially evaluated on three farms in Dominica. During the latter stages of the on-farm validations, the technological package was extended to 25 farms using the 'Task Force' approach. These farms also served as model farms, and formed the nucleus for the supply of high-quality export fruit.

In turn these activities contributed to the Joint Regional Marketing Programme, the objectives of which were to increase the profitability and foreign exchange earnings of fresh produce exports, working in conjunction with private sector exporters.

CARDI continues to monitor approximately 30 farms for fruit fly and anthracnose so that a management strategy can be planned, as well as to forecast crop production for the Dominica Export Import Agency (DEXIA).

This manual is a compilation of technologies from many parts of the world that have been successfully adapted and validated in the Eastern Caribbean. CARDI's own research in the Windward Islands has contributed significantly to this information.

It is the most comprehensive source of information available to technicians and extensionists in the East Caribean. It is hoped that the manual will act as an important resource for extension workers and students and assist the subregion's farmers, exporters and processors to develop Julie mango to its full potential.

Project staff are listed in Annex 2.

1 Marketing

The international mango market is in excess of one billion US dollars. Major producers are India, Pakistan, Mexico, Brazil and the United States (Florida). Mexico is the largest exporter of mangoes in the world. The US is the largest importer followed by the European Union and Canada. In Asia the largest importer is Hong Kong.

Mango is sometimes hailed as the most popular fruit in the world but until recently it was considered an exotic. There are more than 500 varieties but only about 10% are traded on the international market. In the major international markets of North America and Europe, competition is fierce because many producing countries have focused on the few most marketed/promoted varieties, categorised as 'Florida Varieties' i.e. Haden, Keitt, Kent, Tommy Atkins, Palmer, and Van Dyke.

All of the most important traded varieties have intense 'blush' characteristics, i.e. they appeal to the eyes of the customers. Meanwhile others with superior organoleptic qualities with little or no blush, such as Julie, are sidelined.

Julie mango has organoleptic qualities that set it apart from other mango varieties. These qualities are:

Taste: This can't be confused with that of any other mango. It is strong and exceedingly sweet. Anyone who eats a Julie mango will remember that flavour.

Aroma: When ripe, the mango advertises its presence and readiness for consumption. This smell is also a clear indication of its taste. This smell is so pungent that it dominates that of most other fruits when part of a fruit basket.

Size: The medium to small size of this mango makes it very appealing to consumers. A 4.5 kg (10 lb) carton contains between 14 to 20 mangoes. This size makes it convenient to serve a whole mango instead of slices.

Colour: When ripe, the colour of the skin is an array of red, rust, green, and yellow colours. This makes it attractive, although less eye-catching than the Florida types.

The low production of Julie, coupled with a short season in which fruits are available, enhances its 'exotic' marketing appeal. This makes the mango a prize fruit to many consumers. To ethnic West Indian populations in both Europe and North America there is ecstacy when Julie mango is available.

Julie mangoes in the Eastern Caribbean are best marketed as table mangoes between May and August. During this period production is at its peak, and quality is right. This is a relatively dry period of the year, and there is little or no anthracnose. In addition, the bright sunlight creates blush in well managed fields. This is also the beginning of the major fruit buying season in both major markets, i.e. late spring and early summer.

During the peak season mangoes are exported to United States from Grenada and St. Vincent and the Grenadines mainly by air, and to Europe from Dominica and St Lucia by sea. Some European importers, e.g. UK and France, also

import by air from countries with direct international air access.

The harvesting grades of mango for the fresh fruit market are dependent on the method of transportation used. Fully mature mangoes are harvested for air shipment or for sea journeys of less than four days. These are mainly exported to North America and Canada. Stage II mangoes are harvested for sea journeys longer than four days and are the grade which is mostly exported to Europe. (Figure 11.1)

Regional markets

The Caribbean market continues to be the major market for Julie mangoes. The two largest importers are Trinidad and Tobago and Barbados, followed by The Netherlands Antilles, the French Antilles, the British Virgin Islands and US Virgin Islands. However, the latter four countries with their large tourist markets purchase mainly Florida-type mangoes from Florida and Central America.

Nevertheless the market potential for Julie is good since the West Indian population in these islands enjoy Julie, and feel that it is the best mango.

These markets are small but relatively high priced. Mango market promotions are done by the leading suppliers from Miami, while very little is done for Julie and other West Indian varieties. Julie mangoes are sold mainly on their known organoleptic qualities rather than the 'market push' strategy employed by the suppliers of the Florida varieties.

International markets

US imports of mangoes doubled over the five year period 1990–1994. Nevertheless, consumption is considered very low when compared to other tropical fruits such as banana. However, US per capita consumption increased by approximately 10% per year during this period. Mangoes are mainly consumed in cities with high Latino, Asian, and West Indian populations. Demand is expected to continue to grow now that fruit is available year-round. Mexico is the largest exporter to this market supplying 88% of all US mango imports.

Table 1.1 Imports of table mangoes to major markets, 1994

	Volume (tonnes)	*Value (US$ million)*
United States	123,100	107
Canada (C$)	16,400	19
Netherlands	15,500	18
United Kingdom	11,200	12
France	10,300	14
Germany	10,050	10

The Canadian market has grown by almost 75% over the past five years. Like the USA, Canada imports most of its mangoes from Mexico, 69% of total mango imports. The remainder come from the USA, Central and South America and the Philippines. Consumption patterns are similar to those of the US.

The European market continues to grow at approximately 10% per year. The leading importer of mangoes in Europe is the Netherlands which imports mangoes from a variety of sources and then ships them throughout Europe. The United Kingdom, Netherlands, and France are the three largest markets

The European market is supplied year-round from Brazil, Southern Africa, Cote d'Ivoire and the USA. Other suppliers are Mexico, Pakistan, Venezuela, and Israel.

Processed products

Tropical fruit juices are high-cost luxury items and their market prospects in Europe are somewhat limited, particularly during recession years. However, world trade in fruit juices has been increasing and is expected to continue to rise in the future. Separate breakdowns do not exist in trade statistics for tropical fruit juices, concentrates and pulp, other than pineapple. However, the principal three tropical fruit juices, concentrates and pulps (apart from pineapple) are banana, passion fruit, and mango. Together, these account for three-quarters of the trade in tropical fruit juices other than pineapple.

The principal outlets for tropical juices (other than pineapple) are the Netherlands (mainly for re-export), Germany, the United Kingdom, France, and Switzerland. Outside Europe, Saudi Arabia is probably the largest market. The United States is increasingly becoming a major purchaser, although quantities are still small.

Consumers' attitudes towards fruit juices have changed considerably over the last two decades. Traditionally regarded as a breakfast drink in many countries, these juices are now replacing beverages consumed during the rest of the day. One reason for this is the rise of health consciousness.

Orange juice is the preferred type of juice on most markets although some countries in Europe have traditionally consumed large quantities of apple juice. Other citrus juices and pineapple are common juices worldwide. In contrast, demand for tropical fruit flavours remains comparatively low on most markets, except in some Middle East countries. Tropical fruit beverages and dairy products containing tropical fruit are growing in popularity in many markets. (Tropical fruit beverages with a 100% juice content are rarely sold in the retail trade because of their high acidity, and/or viscosity and excessively strong taste.)

Importers in most of the major markets are interested almost solely in bulk-packed fruit juice raw material, in the form of single-strength juice, juice concentrate, or fruit pulp or puree. Demand is also growing for pieces and slices of some tropical fruits.

Fruit juice offered for sale to consumers must be 100% juice and should contain no additives. In recent years interest has increased in juices consisting of two or more fruits, for instance mango and banana; and orange, pineapple, passion fruit, and mango.

A fruit nectar usually contains juice and/or pulp, sugar and water. The minimum juice and pulp content usually varies between 25% and 50% in most nectars, depending on the fruit. The definitions of fruit juice drinks and fruit drinks are not generally precise but both have a much lower juice content than juices and nectars and may include various ingredients such as citric acid, essential oils, and preservatives.

The dairy industry uses imported fruit juice raw material to produce yoghurt, ice cream, desserts, and sauces, etc. It probably accounts for close to 30% of tropical pulp and juice imports. Yoghurt is the most important item in this context. Fruit yoghurts usually have a 10–20% fruit content. Ice cream is another important end-use for mango and other tropical fruit. The dairy industry uses increasing amounts of fruit pieces and slices - particularly of mango.

In addition to the beverage and dairy industries other food industries producing such items as jam, jelly, chutney, baby food, bakery products and confectionery, are estimated to purchase about 5% of tropical fruit juice raw materials imported. These industries also use large amounts of imported frozen and otherwise preserved fruit.

Demand for tropical fruit juice raw material is on the rise in most major markets, partly as a result of promotional activities undertaken by the beverage and food industries, and partly because more consumers travel to countries where they eat the fresh topical fruit. Full consumer acceptance of such juices may, however, take a considerable period of time. On balance, prospects for increased world trade in fruit juices are believed to be good, although any rapid development is unlikely for tropical fruit juices and pulp.

Tropical juices, concentrates and pulp are exported from several countries or areas in Latin America, Africa, and Asia. Mango (mainly pulp) is supplied primarily by Brazil, India, Mexico, the Philippines, Colombia, Venezuela, Thailand, Cote D'Ivoire, Haiti, Peru, Guatemala, Mali, and Taiwan. India is the main producer of processed mango products.

2 Quality and quality standards

The importance of quality

Trade in fresh mangoes is a truly global business. Multinational companies compete vigorously with one another for consumers on the basis of quality, price, consistent availability, and presentation. Some of these 'improvements' may be real and others may be implied or perceived, as a result of the promotional efforts of the vendor.

In addition, the market for mango has also been affected in recent years by:

- downward pressure on product price
- restricted use of chemicals during production and after harvest (which has led to a decline in quality and consequently the price received by farmers)
- environmental impact of the production system and produce packaging (some importing countries may impose restrictions or require the use of more costly materials)
- concentration of the trade by large retailers performing direct procurement
- increased legislation relating to food safety.

The future for Eastern Caribbean mango growers

For growers in the Eastern Caribbean to continue to play a part in this highly structured worldwide business requires significant changes in the way the industry now operates. Producers and exporters need to become more competitive. The cost of mangoes delivered to the market is clearly a major component of that competitiveness but by no means the only one; product quality is the other major factor.

Success in selling any product or service depends upon satisfying customers. All world markets for fresh produce have become more sophisticated along the lines indicated above. Every year new sources of supply come on stream and add to the wide choice offered to customers. Customers make their choices based on the satisfaction level the product will provide. Customer satisfaction therefore, must be the first priority for any exporter of mangoes.

In summary, competition between mango suppliers in all markets is essentially won or lost on:

- product quality
- product availability
- product price
- the service that surrounds the product.

The customer wants quality, availability, price and service (QAPS) that matches his/her requirements. The customer not only demands QAPS but wants it consistently. A product which is variable from week to week, is difficult and expensive to work with, cannot be presold, makes the buyer's business itself unreliable. Inconsistent products are bad for business.

Quality standards and quality assurance systems are the means of establishing optimum systems for the production and handling of mangoes for export markets, and so ensuring that quality mangoes reach the customer.

Quality standards

Standards describe the degree of quality of a given commodity that provide the basis for its usability and value. Standards provide a common basis for trade among farmers, exporters and importers; assist produce handlers in efficiently preparing produce for marketing; provide a basis for pricing and incentive payments; serve as a basis for price reporting; and help settle claims and disputes between sellers and buyers. As a result, standards are of benefit to all participants in the trade.

Statutory standards: Mandatory and voluntary standards have been introduced in many countries defining the quality of produce that can be traded within their boundaries.

US standards for fresh fruit and vegetables are voluntary except when they are required by state and local regulations, by industry marketing orders or for export. Currently no mandatory standards exist for mangoes imported into the USA.

The European Union (EU) has, and continues to, define standards for fresh produce which are mandatory in EU member countries for either produce of EU-origin or imported from outside. Standards are enforced by a horticultural inspectorate which performs assessments at packhouses, at ports of entry, and at markets. Failure to comply with these standards will result in either rejection, resorting and repacking at the exporter's cost or reclassification to a lower grade. The United Nations Economic Commission for Europe (UN/ECE) working party on standardization has published a standard for mango but this has not yet been converted into a common EU standard, which means that it is not legally binding. The UN/ECE standard is presented in Annex 3.

No statutory standards exist for fresh produce for trade within, and for export from, the OECS. However, draft OECS standards have been drawn up but have not yet been made mandatory. The draft mango standard is presented as Annex 4.

Industry standards: Many producer organizations, exporter associations, and import companies have developed their own commercial standards for fresh produce. For mango, it is these commercial standards that producers and exporters in the Eastern Caribbean have to satisfy to ensure market development. Quality control departments of all multiple retail stores use a detailed written specification particular to a given variety against which imports are checked. Entry into this market requires detailed study of these specifications and assessment of how best to achieve the buyers' needs. At present, Julie mango is not sold into these markets so a specific example is not available. Generally, the specification would refer to the following main quality features:

- general appearance should be clean, healthy, free from latex and abnormal surface moisture
- free from decay and spoilage
- free from pest contamination and/or damage
- free from soil
- free from spray deposits
- free from anthracnose
- free from cuts/mechanical damage (some tolerance may be allowed on bruising)
- free from off-flavours/taints

- free from minor windscar/rub marks (some tolerance will be allowed)
- fruit size and shape, characteristic of the variety
- specific stone : flesh ratio
- minimum sugar level at 10%
- fully developed and capable of ripening to good eating quality
- weight and counts ranges specified
- precooling temperature
- storage temperature
- arrival temperature
- type of packaging, specifying inner and outer design and net weight
- labelling requirement.

CARDI has developed a general commercial specification for Julie mango, which can be used by farmers and exporters as a guide, and should be used by exporters to develop the common language required within the mango sector. (Table 2.1)

Standards are intended to protect all participants in the production and marketing chain.

Quality assurance systems

Once a quality specification is set–by whatever authority–producers and exporters must put in place measures to achieve it. This will involve technical innovations, management systems, information systems and records. The whole mechanism can be called a quality assurance (QA) system since it is primarily geared to ensure that product requirements are met consistently. The emphasis of QA systems today is "prevention is better than cure". Designing production and handling systems to achieve a target specification is much more cost effective than trying to rectify problems when they arise. Quality assurance programmes are essential for the development of a competitive industry.

The essential components of a quality assurance system for mango include:

- management commitment to quality
- mango quality specification
- production system designed to produce fruit to the desired specification
- handling system designed to maintain fruit within the desired specification
- critical determining points (high risk areas) in production and handling systems identified
- production records
- packhouse records
- product inspection
- control systems at all levels of the production and handling chain
- farmer and packhouse worker training.

This manual provides information in support of some of these components but cannot attempt to describe the full detail of a QA system for Julie mango, nor is it practical since QA systems are always unique to a company.

Tabe 2.1 OECS export specifications for Julie Mango going to the European market, issued 12 May, 1994

Market	extraregional
Transport	sea
Cleanliness	free of soil, sooty mould and insects minor latex contamination allowed
Colour	Class 1 strong red blush required Class 2 slight or no red blush acceptable
Condition	to be cooled to shipping temperature within 24 hours of harvest
Appearance	Class 1 free of blemish Class 2 minor blemish allowed Glossy, free of shrivelling
Grading	difference in weight between smallest and largest not to exceed 15% as proportion of the largest
Maturity	Fruits in the carton should be uniform in maturity. Only stage 1 & stage 2 fruit are accepted. Stages are characterised by shoulders being level with the stem insert and yellowing of flesh colour extending to 50% from the seed
Trim	stem intact, cut smoothly to 6 mm (0.25 in) loss of stem will result in rejection
Ripening	Changing of peel colour from green to geenish/yellowish/orange, sometimes with a red blush. Fruit should be quarter-ripe (colour change should be 25%) for May to September shipments and half-ripe (colour change 50%) for shipments outside this period. These specifications are for the European market
Pack	Class 1 & 2, 5kg (11 lb) net packed to specific counts Size 14 = 14 count Size 16 = 16 count Size 18 = 18 count Size 20 = 20 count

Sizing

number of fruit/carton	weight range of fruit (g)	net weight of carton (kg)
Size 14	320—360	5.30kg
Size 16	280—320	5.40kg
Size 18	240—280	5.40kg
Size 20	200—240	5.20kg

Labelling	printed labels only on one short side: Julie Mango Net weight Count on one long side: Supplier name
Decay	Class 1: no decay or fungal lesions on arrival in market Class 2: minor anthracnose lesions allowed