

Egbert A. Tai
University of the West Indies, Trinidad

It is generally accepted that modern agriculture in tropical areas was first practised in the early days of colonialism when the main aim was production of items required in large quantities by the metropolitan nations. For this reason there developed plantations where crops like coffee, cotton, sugarcane and tobacco were grown on an extensive scale for export after simple preparation of the produce to enable it to withstand slow travel by sea; interest in horticultural crops which require intensive methods of production and rapid travel was to come much later. However, the existence of tropical fruits, vegetables and ornamental plants in abundance and great variety could not be ignored for long and, in time, the traditional approach to horticulture in temperate regions was adopted in the tropics also: plants were grown to produce crops for immediate use and the local market. It is remarkable that sometimes the names of horticultural crops of more temperate areas were attached quite inappropriately to a number of them, like avocado pear (*Persea americana*) and rose-of-sharon (*Hibiscus mutabilis*). Increasing familiarity bred appreciation of tropical horticultural produce and led to a growing demand most notably, for fruits but also for vegetables, flowers and ornamental foliage. The inevitable outcome has been the movement of larger quantities from the areas of production to the expanding areas of consumption – a prerequisite of a satisfactory export trade.

In this paper, the observations relate to tropical fruits but are believed to apply almost equally to the other crops of tropical horticulture. The main considerations for development must be based on organization and regulation of the supply to meet the changing demand. It is necessary to take into account in each instance the potential for development, the various factors of production and the chain of distribution from point of origin to ultimate consumer.

Demand for tropical fruits

The ease with which it is possible to travel about the world today has helped greatly in spreading knowledge of the tropics and products of tropical regions; as a consequence familiarity with tropical fruits is encountered in nearly all countries and the taste for them has developed in areas of the temperate regions distant from where they are grown. At one time tropical fruits from developing countries were luxury items in the sophisticated communities of North America and Europe, but the interest in their consumption has grown from mere curiosity, perhaps, through snob demand, to genuine preference. The time is ripe for expansion in production and trade with the aim of benefiting both growers and consumers.

Table 1 gives an indication of the rate of increase of the demand for tropical fruit in three European countries; available bulk import figures are shown for the period 1961-1965. The remarkable growth in demand has occurred for both fresh fruit and processed products as can be seen from the data presented in Table 2 for whole, fresh avocado fruit and Table 3 for mango products (slices, pulp, preserves).

It seems clear that there exist assured outlets for at least some tropical fruits; why should not these outlets be widened and efforts made to extend the range of fruits acceptable to markets existing outside of the tropics? What appear to be required for success in such an undertaking are controlled, orderly production and regulated, efficient distribution.

In several tropical countries, and I have in mind the Caribbean islands particularly, many types of fruit are harvested in varying quantities each year from wild or semi-wild trees in scattered locations. It

Table 2. Imports of avocado².

Country	1966		1967		1968		1969	
	Tons	Value (£000)	Tons	Value (£000)	Tons	Value (£000)	Tons	Value (£000)
France	800	182	1591	367	2309	587	2232	559
United Kingdom	1100	360	1300	460	2020	650	1926	594
Italy	11	3	27	7	55	16	70	19
Switzerland	21	n.a.	32	n.a.	80	n.a.	80	n.a.

²From Stother, J. Tropical Products Inst. Rpt. G60, 1971.

Table 3. Imports of mango products (tons)².

Country	1965-66	1966-67	1967-68	1968-69	1969-70
United Kingdom	1845.4	1802.8	1588.3	1642.2	2692.6
U.S.S.R.	1180	1497	2062	1966	6482
EEC & Scandinavia	96	123	152	211	267
Middle East	38	38	34	48	117
U.S.A.	351.2	244.3	238.7	303.0	408.5
Canada	32.6	36.1	38.1	39.8	42.7

²From Jones, A. Tropical products institute report. G74. 1973.

is remarkable that non-indigenous species are included. The mango, which was introduced from the Far East and has become feral, provides a case in point. It is reasonable to expect that this fruit and others can, under suitably organized production, be made profitable export items. The situation calls for exploitation of the existence of overseas demand for the products as well as natural conditions favorable to growing the crop plants.

The extent of the scientific knowledge and technology available for direct application to horticultural production in temperate countries is known to be great and continually increasing; this is not so in tropical areas but the lines of the pattern are there to follow and we can profit by extrapolating from temperate horticultural experience while we acquire our own. There is recognized need for

1. enlargement of existing knowledge through carefully directed research;
2. transmission of information obtained from the results of research by scientists to the horticultural "practitioners" in such a way that they will benefit from its application;
3. maintaining a supply of personnel to carry out effectively the research and transmission of information by operation of a satisfactory training program to turn out horticultural scientists, technologists and technicians.

Research areas of importance

The field is wide open for research on tropical fruit crops because with the exception of banana, studies in the area have not been in progress for long; it is considered desirable for the purpose of development for export that there be concentration on

Table 1. Imports of tropical fruit².

Country	1961		1962		1963		1964		1965	
	Tons	Value (£000)	Tons	Value (£000)	Tons	Value (£000)	Tons	Value (£000)	Tons	Value (£000)
France	196.8	31.4	325.8	66.9	436.0	96.5	532.4	126.6	703.7	165.5
United Kingdom	n.a.	n.a.	n.a.	n.a.	546	166	897	236	799	273
Sweden	n.a.	n.a.	n.a.	n.a.	2.0	1.1	6.9	2.7	10.8	3.5

²From Slother, J. Tropical Products Inst. Rpt. G60, 1971.

1. Selection, improvement and multiplication
2. Cultural practices
3. Postharvest handling
4. Marketing procedures

Work may be possible on a small scale by individual producers, but it is preferable to ensure involvement of interested groups and associations on a national or international scale. In this way there can be coordination of inputs into specific programs and economy in the use of resources.

Selection. The abundance in which tropical fruits occur in their native habitats or transplanted to suitable environments is often a handicap to economic development. A statement made by the well known horticultural scientist, F. R. Tubbs, at the Conference on Tropical and Sub-tropical Fruits held in London September, 1969, is worth quoting in this connection: "*there has been a tendency to refer to tropical fruits by crop, not by variety within a crop . . . variety affects not only propagation and field culture but also fruiting season, commercial value and optimum conditions for storage, transport, canning or preservation . . . It is of great importance, therefore, that early attention be given to vegetative propagation of the best cultivars for commercial planting and, at the same time to cultivar description.*"

Adherence to clearly defined standards, establishment of grades and uniformity among items placed in any one grade are always important desiderata in production and marketing and apply no less to tropical fruits than to other products. It is essential for profitable development that there be assortment and selection followed by multiplication of types which appeal to the markets, the ideal being kept constantly in mind. It may be required to synthesize by hybridization new crop plants possessing characters which previously existed in different varieties or species.

Capacity for high yield, superior quality and disease resistance are frequently the main criteria for selection and improvement. These can be "fixed" in a population by adopting procedures for vegetative propagation in the multiplication process, and devising improved methods of vegetative propagation should be an important aim of investigations.

Cultural practices. Refinement of field procedures can, undoubtedly, lead to greater yields and higher quality which, in turn, bring larger economic returns. The effects of each factor which may influence productivity merits study and the information gained applied to modifying the micro-environment in which each fruit tree grows so as to meet as many as possible of its requirements and preferences. Use of widely diverse scientific disciplines will be necessary to determine optima in time of planting, population density, nutrition, soil moisture, protection from pests and diseases etc. with the aim of peak efficiency in production including regulation of the time and duration of harvest.

Postharvest handling. The main theme of this symposium is the treatment of tropical horticultural produce after it has been gathered from the field. There can be no doubt that the post-harvest handling link in the chain of operations from production to consumption is usually the weakest in the development of tropical fruits for export.

In most instances fruits for export fresh to other countries must be picked before fully mature. Ripening takes place during subsequent transport and storage under controlled environmental conditions. The technique found satisfactory for any one fruit will seldom serve as well for others and the necessity for specific research can not be avoided. The particular market for which the fruit is destined – the distance from source, national restrictions, peculiar preferences of the clientele – will also have a direct bearing on suitable postharvest handling and the details must be developed from careful experimentation. Packaging methods and materials, storage temperatures, composition of the atmosphere, use of chemicals to prolong storage life must all be subjects of intensive research.

Processing of fresh fruit for the export market is here included with postharvest handling. Preservation by drying, canning and manufacturing of juices, purees, jams and jellies all extend the potential for development if the procedures are based on sound research.

Marketing. For orderly, effective marketing, investigation of consumer requirements coupled with sales promotion is required. The development of large wholesale markets in the consumer countries – like Nine Elms in London and Rungis near Paris – is worth careful study, particularly in respect of their functions of price-setting and

bulk-breaking, location and possibility of increased cooperation between growers and wholesalers. The methods commonly adopted for sale should also be subject to close examination to determine whether open market, contracts, cooperatives or commodity marketing boards will bring greater profit to the grower of tropical fruits under any particular set of conditions.

Advisory services

In order to derive benefit from the results of research, it is necessary to communicate these results to participants in the tropical fruit production industry. The employment of mass advisory methods has an important place in the general scheme without preclusion of advice given to individual growers. Provision must be made for collation and dissemination of information on the different fruit crops; it is therefore highly desirable to establish information centers within easy access of those who will require to use them, and growers of most tropical fruit crops certainly will. Linkage of these sources of information through coordination of the services they offer can make their contribution to development of tropical fruit crops for export or local consumption truly considerable. The "Directory of Horticultural Workers in the Caribbean" first issued in 1974 by the Association of Caribbean Universities and Research Institutes lists horticulturists, their areas of interest and the institutions to which they are attached; 85 workers in tropical fruits are listed.

Training of horticulturists necessary

There are few institutions which offer special training in Tropical Horticulture – the University of Hawaii is perhaps the best known. However, courses in the subject occur in the curricula for both undergraduate and graduate degrees of a number of universities. These are not at present fully supplying the need for scientific, technical and management personnel essential for meaningful development of tropical horticultural crops. It is essential that greater emphasis be placed on the importance of specific training in Tropical Horticulture at all levels; diplomas, baccalaureates and higher degrees in the subject should be included in the programs of institutions of learning in tropical countries. There material is easily found for basing projects for theses and dissertations.

International Center for Tropical Fruits

"*There is a shortage of reliable research data on many of the crops in the tropics. Experimentation is much needed on most of the important tropical fruits.*"¹ This statement is no less true today than when it first appeared in print several years ago and, although there exist scattered research projects dealing with tropical fruit, there has not been the type of concentrated and coordinated effort which is responsible for the success attending production of temperate fruits like apple and some sub-tropicals like orange.

Good production in the developing countries is currently receiving welcome attention from specially established centers provided with facilities for extensive and intensive research and also outreach activities: CIMMYT, CIAT, CIP come readily to mind. There is as yet no *Center for Tropical Fruits*. Although tropical fruits may not be indispensable for proper diet, there is no doubt that the demand for them is on the increase world-wide and total scientific knowledge of their production and handling lags behind the potential for their development. Beside providing sources of sugars, proteins, fats, vitamins and minerals in the diet of the consumers, development of a tropical fruit export industry can bring increased employment opportunities to the peoples of developing countries, earn foreign exchange for importation of consumer goods and improve the quality of life for the population. A Center for Tropical Fruits with associated outreach activities may reasonably be expected to hasten the arrival of the time when there is satisfactory exploitation of the capability of the tropical region to grow fruit crops on currently under-utilized areas of land for consumption in all parts of the world.

¹Mortensen, E. and E. T. Bullard. 1964. Handbook of tropical and subtropical horticulture. USAID.