

TROPICAL FRUITS

Béla Berényi

Szent István University, Gödöllő, Hungary

Keywords: history, ecology cultivated plants, cropping system, tropical fruits, tropical regions.

Contents

1. Banana
 - 1.1. Varieties
 - 1.2. Ecological characteristics
 - 1.3. Moisture
 - 1.4. Light and soil
 - 1.5. Cultivation techniques
 - 1.6. Preparation of soil
 - 1.7. Preparation for planting
 - 1.8. Rate, depth, and methods of planting
 - 1.9. Time of planting
 - 1.10. Fertilizing
 - 1.11. Irrigation
 - 1.12. Weed control
 - 1.13. Harvesting
2. Mango
 - 2.1. Ecological characteristics
 - 2.2. Temperature
 - 2.3. Moisture
 - 2.4. Soils
 - 2.5. Methods of cultivation
 - 2.6. Rate, depth, and methods of planting
 - 2.7. Irrigation
 - 2.8. Harvesting
3. Pineapple
 - 3.1. Ecological characteristics and temperature
 - 3.2. Moisture
 - 3.3. Soils
 - 3.4. Methods of cultivation: seedbed preparation
 - 3.5. Mulching
 - 3.6. Planting material
 - 3.7. Rate, depth, and methods of Planting
 - 3.8. Fertilizing
 - 3.9. Weed control
 - 3.10. Harvesting
4. Papaya

- 4.1. Ecological characteristics: temperature
 - 4.2. Moisture
 - 4.3. Soil
 - 4.4. Methods of cultivation: rate, depth, and methods of planting
 - 4.5. Fertilizing
 - 4.6. Harvesting and storage
 - 5. Avocado pear
 - 6. Guava
 - 6.1. Ecological characteristics
 - 6.2. Soils
 - 6.3. Methods of cultivation: rate, depth, and methods of planting
 - 6.4. Fertilizing
 - 6.5. Irrigation
 - 6.6. Harvesting
 - 7. Coconut
 - 7.1. Breeding and selection
 - 7.2. Ecological characteristics: temperature
 - 7.3. Moisture
 - 7.4. Soils
 - 7.5. Methods of cultivation: propagation methods
 - 7.6. Fertilizing
 - 7.7. Rate, depth, and methods of planting
 - 7.8. Weed control
 - 7.9. Harvesting.
 - 8. Passion fruit
 - 9. Litchi and longan
 - 10. Soursop and other annonas
- Glossary
Bibliography

Summary

In this chapter the major fruits grown in the tropics are discussed. The tropics are situated between the Tropic Cancer and The Tropic of Capricorn at latitude of 23.5 N and 23.5 S respectively. The average temperature is 27 °C and the warmest month are only a few degrees warmer than the coldest. The difference between day and night is greater than between winter and summer. General information is presented on banana, mango, pineapple, papaya, Avocado, guava, coconut, passion fruit, Litchi, longan, soursoup and other *Annonas* crops.

1. Banana

The banana plant originated in South East Asia, and belongs to the family *Musaceae*. The genus is *Musa*.

The great majority of the fruits of banana (*Musa sp.*) are used as fresh food, but some green bananas are dried and a flour can also be produced. Banana powder contains 5 to 6% starch, and up to 80% sugar is obtained from banana fruits. Much of the world's

banana production is for the local population as fresh food. In tropical countries banana consumption varies from 50 to 200 kg per capita annually (see Figure 1.)

The banana is grown in all tropical and some subtropical countries, e.g. Lebanon, Spain. The world area under banana cultivation is about 3million hectares; the average yield is 13 tons per hectare. World production of banana exceeds 40 million tons. About 20% of bananas are raised for export.



Figure 1. Banana propagation in research station (photo: Dr. Berényi Béla)

The largest commercial production (see Table 1) is concentrated in Central America (Guatemala, Mexico, Panama, Nicaragua) and South America (Brazil, Columbia), as well as in West and East Africa (Kenya, Tanzania, etc), and South and South-East Asia (India, Indonesia, Thailand, Vietnam, Philippines). Bananas can also grow quite well in oases and mountain wadis in Arabia and North Africa, where sufficient water can be made available for such crops

	1989-91	1997	1998	1999
India	7138	10982	11000F	11000F
Ecuador	3052	7494	4563	6392
Brazil	5730	6095	5506	5592
China	1813	3097	3734	3996F
Philippines	3018	3774	3561	3561F

F = FAO estimate

(Source: FAO Production Yearbooks 1999)

Table 1. Leading banana growing countries in the world (annual production x 1000MT)

Source: FAO Production Yearbooks 1999

Cultivars of edible bananas are sterile triploids (2n=33). These varieties are often related

to the botanical species *M. paradisaca* L., *M. sapientum* L., or *M. nana* Lour. They are different in fruit quality and in heat response, and can normally grow only in the tropics. *M. riana* Lour is more resistant to cold and can tolerate temperatures as low as 10 °C. The banana is a perennial grassy plant, with a mighty rootstock, which is an underground stem or rhizome.

The majority of cultivated bananas originated from *M. acuminata* and *M. balbisiana*.

1.1. Varieties

Among the sweet banana varieties for export the most popular are Gros Michel (Lady's Finger) and Cavendish. Dwarf bananas are short fruited, early-ripening and high-yielding. The Poyo has become very popular for local consumption in Cuba.

1.2. Ecological characteristics

As regards temperature, banana is clearly a thermophilous plant. It grows best at 24 to 29 °C. Throughout the year the growth of bananas is retarded at temperatures of 20 °C or less, and by more than short periods of 35 °C or more. Short cold period of 5 to 8 °C are hazardous for bananas.

1.3. Moisture

Bananas are cultivated successfully in the humid and humid variable tropics with a short dry season. For normal vegetation bananas require minimum monthly rainfall of 50 millimetres, the optimum precipitation being 100 millimetres. In the dry tropics and subtropics, bananas are grown only under irrigation. This crop drastically decreases its yields in the humid tropics with a long dry season. Bananas poorly withstand droughts, and are completely resistant to inundation. In the principal areas of banana cultivation these plants suffer severely from high winds.

1.4. Light and soil

The banana is a light-demanding plant, but, high solar radiation is undesirable for young banana plants.

As regards soils, banana plants depend on the development of a strong root system, which usually develops in the surface soil layer. Bananas prefer medium-textured soils with high humus content and good drainage. The optimum pH is 5.5 to 7.0.

1.5. Cultivation techniques

Banana are most often raised without rotation with other crops. They are rotated with sugar cane or cassava only on small farms. On large plantations they are cultivated singly, as a pure crop. Inter-cropping is practiced on small farms, with the inter-row spaces sown with taro, xanthosoma or pineapple. On large plantations they are cultivated singly, as a pure crop. In tropical countries bananas may be occasionally planted in the row spaces among hevea, coffee and oil palm.

1.6. Preparation of soil

Bananas are highly demanding of soil fertility and friability. The soil is loosened to a good depth. Best results have been obtained from deep (up to 60 centimetres), multistage plowing followed by two or three shallower plowings (up to 30 centimetres). The plantations need to be drained and supplied with irrigation canals.

1.7. Preparation for planting

The banana is propagated only vegetatively in mass production. Suckers or rhizomes are used for planting and it is best to select banana suckers when the parent plant is fruit-bearing. In the subtropics, 4 to 7 month old suckers are usually chosen for planting when they reach about 150 cm in height. In the tropics, younger suckers, up to 1m high, are used. Rhizome propagation is employed only in the tropics. Rhizomes are dug out from old plantations, cut into separate pieces weighing about 2 kg, fungicide-treated, shade-stored for at least two weeks, and then planted. In East Africa, broad-leaved suckers are virtually the only types of material used.

1.8. Rate, depth, and methods of planting

The density of banana plantations varies greatly. In the 2.5 x 2.5 meter scheme, short-statured varieties are used. The 5 x 5 meter planting scheme uses tall statured varieties. It has become a common practice to crowd the planting scheme, particularly using dwarf varieties, with up to 3000 plants per hectare (2 x 2 meters). In East Africa, the recommendation for pure stands is 3.6 to 4.5 meters between planting holes for tall varieties on fertile soils, giving about 480 to 750 plants per hectare.

Each hole should be at least 0.6 m deep and 0.6 m in diameter. It should be filled with topsoil that has been mixed with organic manure and about 220 g of single superphosphate.

1.9. Time of planting

The best time for planting bananas is the beginning of the rains. Preference is usually given to annual food crops. In areas with a continuous supply of ground water any time of the year is satisfactory.

1.10. Fertilizing

The productive life of a banana plantation is between 3 and 10 years. Each ton of banana fruits requires about 2 kilograms of nitrogen, 0.9 kilograms of P₂O₅ and 7 kilograms tons of K₂O.

Fertilizers and manure are seldom used on bananas in East Africa even though a steady supply of nitrogen is essential for optimum yield.

1.11. Irrigation

During the dry season bananas require irrigation. In India, when being grown on heavy-textured soils, bananas are irrigated every 8 to 15 days. In West Africa they are irrigated weekly. The water requirement varies from 600 to 1000 cubic meters per hectare. The most effective form of irrigation is sprinkling.

1.12. Weed control

If the land is properly prepared before planting, if the correct spacing is adopted, and if mulching is practiced, weed control should require little effort. Cultivation should always be shallow in order to minimise damage to the roots. Bananas are very susceptible to most hormone herbicides.

1.13. Harvesting

The colour of the fruits when they are ripe varies considerably between varieties. Some, especially cooking varieties, remain green even when ripe. Harvesting of banana is usually manual. Banana clusters are cut with special knives and packed into boxes and transported to storehouse where they are laid on special straw mats.

Ripe fruit are not transportable. Green fruits are usually transported as whole composite fruits packed in polyethylene or paper bags at temperatures strictly maintained for each variety (11 to 13 °C) and at high air humidity (see Figure 2).



Figure 2. Banana plantation (photo: Dr. Berényi Béla)

2. Mango

Ripe fruits of mango (*Mangifera indica* L., Family Anacardiaceae,) are eaten raw as a snack or dessert, and are used in the manufacture of juice, squash, jams, jellies, preserves (see Figure 3). They are also canned. Mango pulp is blended with wheat flour and processed in various forms such as flakes and vermicelli, which serve as a breakfast food. The production of mango ‘leather’ or bread made from the pulped flesh of ripe mangoes is a small-scale industry in India. Dried juice powder is used in India in the preparation of ice creams and infant foods. Seed kernels are used as food in times of scarcity. Young leaves and shoots are eaten as vegetables in Java and the Philippines.



Figure 3. Mango fruit

Mango is indigenous to tropical Asia, in an area bounded by Sri Lanka, eastern India, Bangladesh and Vietnam.

It is now widely cultivated throughout the tropics (see Table 2.). Mango is an evergreen branched tree, living for 100 years or more, with a dense dome-shaped crown. Height depends on the variety. Some small-fruited types grow up to 20 m. Leaves are produced in flushes.

	1989-91	1997	1998	1999
India	8634	12000F	12000F	12000F
China	824	2150F	2127F	2127F
Mexico	1101	1500	1474	1449
Thailand	903	1350F	1250F	1250F
Philippines	338	987	932	932F

F = FAO estimate

Source: FAO Production Yearbooks 1999)

Table 2. Leading mango-growing countries in the world (annual production x 1000MT)

Source: FAO Production Yearbooks 1999

2.1. Ecological characteristics

Mangoes are often found naturalised along watercourses, or where there is a high water table. They grow well in areas receiving poor and erratic rainfall. They do best in climates with poorly marked seasons and dry weather for flowering and fruit set. High winds with high temperatures and low humidity can result in leaf scorch.

2.2. Temperature

Optimum growth temperatures are 23 to 27 °C, but mango is tolerant of temperatures from 5 to 43 °C, although growth is reduced below 10 °C.

2.3. Moisture

Mangoes will grow in areas with an annual rainfall of 750 to 2500 mm, provided there is an adequate dry season. Where the water table is high they will grow in areas with rainfall as low as 250 mm.

2.4. Soils

Mango trees thrive on a wide variety of soils provided they are not too waterlogged, alkaline or rocky. In India mango is grown on alluvial and lateritic soils. Even shallow, impervious soils produce mangoes, but production is best on deep soils. A pH of 5.5 to 7.5 is preferred.

Fertile soils, with plenty of water, may lead to luxuriant vegetative growth, but poor fruiting.

-
-
-

TO ACCESS ALL THE 26 PAGES OF THIS CHAPTER,
Visit: <http://www.eolss.net/Eolss-sampleAllChapter.aspx>

Bibliography

- Acland, I. D. (1971): *East-African Crops* (Longman Ltd/FAO, London, 252. p)
- Arnon A. (1991): *Agricultural production in dry lands*. (New York, London, Kuala Lumpur, Rome 525 pp.)
- Berényi B. (1998): Introduction of new species of plants to Hungarian Agriculture. M.Sefic Yesilsoy International Symposium on Arid Region Soils, Turkey.
- Chapman, S.-Carter, L. (1976): *Crop Production, Principles and Practices* (W. H. Freeman and Company, San Francisco, 533 pp.)
- Cobley, L. S. (1970): *The botany of tropical crops*. (Ed. Engl. Lang. Book Soc. - Longman Group Ltd. London, 357 pp.)
- Cox, G. W.-Atkins, M. D. (1979): *Agricultural Ecology*. (W. H. Freeman and Company, San Francisco, 721 pp.)
- FAO (1999): *Production Yearbook*, Rome.
- Ochse, S. J. et al. (1970): *Tropical and subtropical agriculture* (Third edition Macmillan, New York 760 pp.)
- Rice R.R. Rice L.W. Tindall H.D. (1993): *Fruit and Vegetable Production in Warm Climates*. The Macmillan Company, London-Basingstoke
- Sampson J.A. (1980): *Tropical Fruits*. Longman Group Limited, London and New York.
- Wilsie, C. P. (1969): *A természetett növények alkalmazkodása és elterjedése a Földön*. (Mezőgazdasági Kiadó. Budapest, 419 pp)
- Yamaguchi, M. (1983): *Word Vegetables*. (Press in Ellis Horwood Limited, Chichester, 396 pp.)