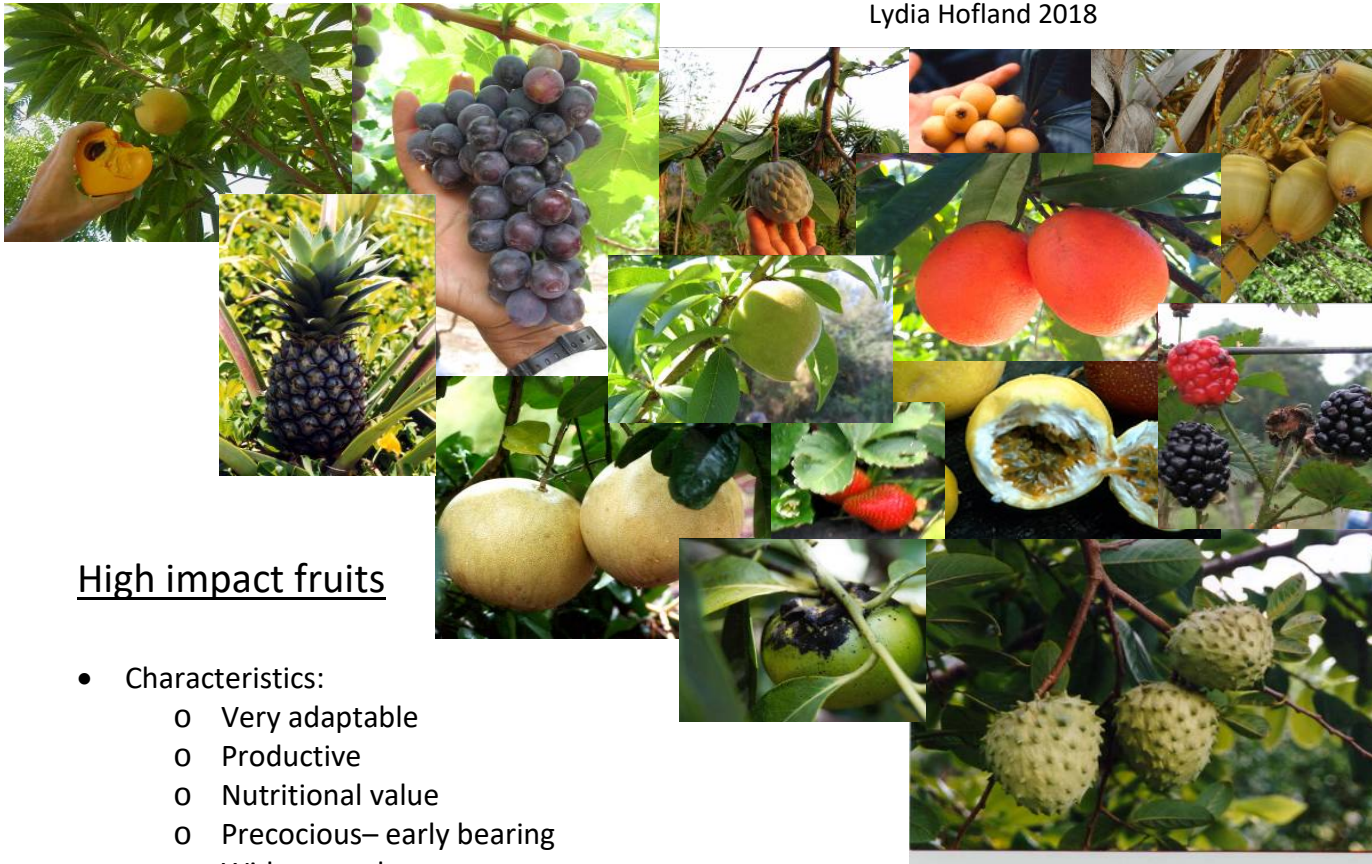


High Impact Fruits

Lydia Hofland 2018



High impact fruits

- Characteristics:
 - Very adaptable
 - Productive
 - Nutritional value
 - Precocious— early bearing
 - Wide appeal
 - Enthusiasm building
- Introducing trees, you need enthusiasm building species
 - Early maturing, enthusiasm building species
 - Reliable/hardy/highly adaptable fruits...tolerating wide range of soils, climate conditions, cultural practices
 - Low maintenance-disease and pest resistant
 - Tolerant of low fertility... 'thrifty trees'
 - "Extending the season" with early and late maturing varieties
 - See Table 3: Characteristics of Tropical Fruit

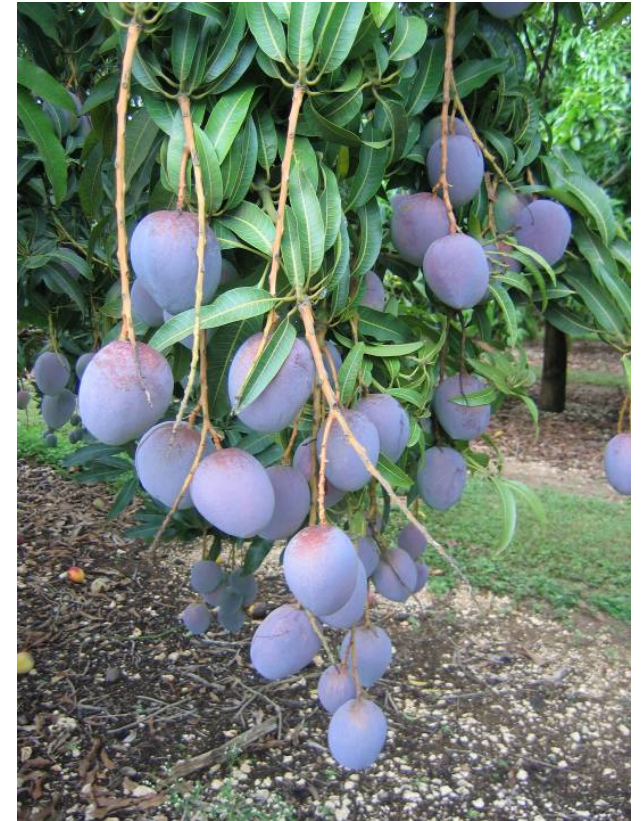
Jackfruit: *Artocarpus heterophyllus*

- Precocious, High yielding (world's largest tree fruit), Fast growing, widely adaptable, Fruit has wide appeal. Can be eaten 'green' or ripe. Fruit weight range 10-60 lbs.
- Yield: In India, a good yield is 150 large fruits per tree annually, though some trees bear as many as 250 and a fully mature tree may produce 500, these probably of medium or small size. (Morton, J. 1987. Jackfruit. p. 58-64)

High impact fruits of the **Wet/Dry tropics**: Mango, Jackfruit, Citrus, Breadfruit, Papaya

Rainfall ranges from 2000mm to <700mm via two distinct rainy seasons or a single rainy season

- Mango: *Mangifera indica*
 - Widely adaptable, tolerant of many soil types, drought tolerant, thrives on low fertility soils, fruit is highly nutritious, global appeal, productive
 - Range: mango is naturally adapted to tropical lowlands between 25°N and 25°S of the Equator and up to elevations of 3,000 ft (915 m)
 - Climate: The best climate for mango has rainfall of 30 to 100 in (75-250 cm) in the four summer months (June to September) followed by 8 months of dry season. This crop is well suited to irrigated regions bordering the desert frontier in Egypt.
 - Yield: t 10 to 20 years, a good annual crop may be 200 to 300 fruits per tree. In Florida 20-30,000 lbs./acre (100 trees/acre)
 - Rich diversity of cultivars, many opportunities for prolonging/extending season with multiple varieties
 - Timing of rain is important for flowering and good production, high rainfall/hot humid lowlands can produce erratic production and disease problems
- Breadfruit: *Artocarpus altilis*
 - “Staff of Life in South Pacific” adapted to hot, humid tropics, salt tolerant, tolerates heavy soils. Grows at mid elevations, monsoon climates (may lose leaves during dry season) (Martin)
 - Seedy and Seedless types (Seedy types are called ‘Breadnut’ *A. camansi*). Propagate seedless types from root cuttings or root suckers.
 - Mature, green fruits are rich in starch, but low in protein, fat, minerals and vitamins.
 - Yield: Average production is 100-200 fruit/tree. Fruit range from ¾ lbs. to 13 lbs. 16-50 tons/ha based on 100 trees/ha planting density. (Breadfruit Institute NTBG)



High impact fruits of **Tropical Highlands**: Avocado, Loquat, Apple, Peaches, White Sapote, Macadamia

- A reduction of 10°C for each 1000m rise in elevation
- Low chill fruits
- Ethiopia: Peaches fruiting at 7000ft (2130m), Apple fruiting at 9500ft (2900m)
- Kenya: Macadamia produces up to 6100ft (1870m)
- 10°C = 18°F, 1000m = 3280ft



- Avocado: *Persea americana*
 - Rich in oil, widely adaptable (because there are 3 races of avocado) Mexican, West Indies, Guatemalan. Adaptability is due to the different tolerances of the three ecological races (Prosea 251)
 - Yield: Average yield is 8-10 tons/ha or 120 kg/tree
 - Fruits are rich in oil, up to 30% (can be as low as 3% depending on cultivar), also rich in protein and vitamins and minerals. (Gaillard and Godefroy 1995)
 - Requires well-drained soil, (as little as 24 hours of flooding can kill trees (Prosea 251) sensitive to salinity)

High impact fruits of the **Humid Tropics**: Banana & Plantain, Citrus, Papaya, Jackfruit, Avocado, and Breadfruit

Rainfall: well distributed 2000-5000mm

- Within 5°-10° of the equator
- Consistent high humidity, heat and rainfall
- Two types:
 - A) No dry season 2000mm + rainfall
 - B) Transition between humid and wet/dry tropics <2000mm rainfall, has drier period with <100mm rainfall
- Banana and Plantains: *Musa sp.*
 - Well adapted to the hot, humid tropics. Thrive in heavy rainfall areas, yet grow best in well drained soils. Will tolerate some shade, generally not wind tolerant.
 - Yield: Will produce in 12-18 months depending on cultivar and cultural practices, Plants can yield 10-60 tons/ha
 - Excellent source of starch, can be cooked green/unripe or eaten ripe



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- Papaya: *Carica papaya*
 - Extremely productive, short time to production, require well-drained soils, well distributed rainfall or irrigation during dry season for high productivity.
 - Yield: Commercial yields up to 30-40 MT/ha! (27-36 kg/plant) (CRANE)
 - Production begins 7-11 months after planting (commercial situation) (CRANE)

High impact fruits for the Semi-arid, Dryland Tropics: Tamarind, Jujube, Baobab, Mango, and Marula

Rainfall: less than 700mm

- Mainly between 15° and 20°N and S latitudes to the North and South of the monsoon climate zones
- Hot, dry, desert conditions
- Tamarind: *Tamarindus indica*
 - Adapted to wide range of soils, abundant fruit producer, 150-300 kg/year (Kenya), less in West Africa, Pulp is 30-50% of fruits,
 - Fruits contain high levels of protein, fats and carbohydrates, energy, Vitamin C, and minerals. (Jama 2006)
- Jujube: *Zizyphus mauritiana*
 - Fruit are rich in vitamin C and minerals, especially phosphorous and calcium.
 - Eaten raw, mostly by children or fed to animals. Moderate levels of energy, protein and carbohydrate. (Jama 2006)
- Baobab: *Adansonia digitata*
 - Fruits are rich in vitamin C, used in porridges, or eaten by children.
 - Leaves are rich in vitamin A, calcium, energy, carbohydrates and minerals (sodium, phosphorus, magnesium, iron and potassium) (Jama 2006)
- Marula: *Sclerocarya birrea*:
 - Although there is considerable variation, the fruits are rich in vitamin C, about five times higher than that of the citrus fruit (Leakey, 1999).



Nuts and Oil Producers: Coconut palm, Oil Palm-African palm

- African Oil Palm: *Elaeis guineensis*
 - Oil is rich in carotenoids, (source of Vitamin A) from which it derives its deep red color, high in glycerides and saturated fats. (FAO Agriculture Service Bulletin 148) Red palm oil is the highest plant source of provitamin A carotenoids (Cheboswony 2010)
 - Requires minimum annual rainfall of 1600 mm, thrives in hot, humid lowlands
 - Small holders interplant with fruit trees and annual crops
 - Fruit/nuts are produced in bunches weight 10-40 kg
 - Modern high-yielding varieties developed by breeding programs, under ideal climatic conditions and good management, are capable of producing in excess of 20 tonnes of bunches/ha/yr, with palm oil in bunch content of 25 percent. This is equivalent to a yield of 5 tonnes oil/ha/yr (excluding the palm kernel oil), which far outstrips any other source of edible oil.
 - Hybrid cultivars are extremely productive; called 'Tenera', are crosses between 'Dura' and 'Pisifera' wild types. Ingredient in much of the traditional West African cuisine. (FAO Agriculture Service Bulletin 148)
- Coconut Palm: *Cocos nucifera*
 - Widely adaptable, common in coastal areas of the tropics, can be successful in upland and interior areas as well as long as water is not limiting (Martin?)
 - Yield: 50 nuts/tree/year, if well managed (Martin ?), 2,500-7,500 nuts/ha
 - Copra (dried coconut meat) is main food product, coconut milk and jelly are also consumed (Pursglove 1972)
 - Nutrition: Very nutritious, contains dietary fat, dietary fiber, protein, carbohydrates, microminerals such as potassium and phosphorous, and vitamins such as niacin and riboflavin. (FAO Bawalan and Chapman 2006)
- Date Palm: *Phoenix dactylifera*
 - Will grow in all warm climates, must have a long, hot growing season and no rain for fruit production. Requires daily temps of 90 degrees F during growing season (32 degrees C) Thrives in middle East and North Africa, but production has spread to Australia, India, Brazil, California
 - Yield: Ordinarily, in palms 5 to 8 years old, the first crop will be 17.5 to 22 lbs (8-10 kg) per palm; at 13 years, 132 to 176 lbs (60-80 kg). (Morton 1987)
 - High in carbohydrates, Vitamin B-complex, Iron and magnesium, good source of potassium



Table 1. Nutritional composition of 100 g of selected tropical fruits.^z

Fruit	Water (%)	Calories	Protein (g)	Fat (g)	Carbohydrates			Minerals					Vitamins				
					Total (g)	Fiber (g)	Ash (g)	Ca (mg)	P (mg)	Fe (mg)	Na (mg)	K (mg)	A (IU)	Thiamine (mg)	Riboflavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Sugar apple, raw	73.3	94	1.8	0.3	23.7	1.7	0.9	22	41	0.6	11	275	10	0.1	0.14	1	34
Avocado, raw, Fl	78	128	1.3	11	8.8	-1.5	0.9	10	42	0.6	4	604	290	0.11	0.2	1.6	14
Carambola, raw	90.4	35	0.7	0.5	8	0.9	0.4	4	17	1.5	2	192	1200	0.04	0.02	0.3	35
Lime, raw	89.3	28	0.7	0.2	9.5	0.5	0.3	33	18	0.6	2	102	10	0.03	0.02	0.2	37
Longan, raw	82.4	61	1	0.1	15.8	0.4	0.7	10	42	1.2	—	—	—	—	—	—	-6
Lychee, raw	81.9	64	0.9	0.3	16.4	0.3	0.5	8	42	0.4	3	170	—	—	0.05	—	42
Mamey, raw	70.2	107	1	0.5	27.6	1.4	0.7	22	14	0.9	6	226	60	0.02	0.02	1.4	23
Mango, raw	81.7	66	0.7	0.4	16.8	0.9	0.4	10	13	0.4	7	189	4800	0.05	0.05	1.1	35
Papaya, raw	88.7	39	0.6	0.1	10	0.9	0.6	20	16	0.3	3	234	1750	0.04	0.04	0.3	56
Passion fruit, purple, raw,	75.1	90	2.2	0.7	21.2	—	0.8	13	64	1.6	28	348	700	Trace	0.13	1.5	30

^zSources: U.S. Department of Health, Education and Welfare and Food and Agriculture Organization of the United Nations. 1972.

Table 2: Tropical Fruits by Region					
Setting:	Humid Tropics	Wet/Dry Tropics	Dryland Tropics	Tropical Highlands	Urban settings
Rainfall:	5000-2000 mm	1700-1200mm	1200-500mm		
<i>Mango</i>	x	x	x		x
<i>Banana</i>	x	x	x	x	x
<i>Papaya</i>	x	x	x		x
<i>Jackfruit</i>	x	x			
<i>Avocado</i>	x	x		x	
<i>Citrus</i>		x	x	x	x
<i>Carambola</i>	x	x			x
<i>Lychee</i>				x	
<i>Guava</i>	x	x	x	x	x
<i>Annona</i>	x	x		x	
<i>Others:</i>	Mamey Sapote, Durian, Cacao, Mangosteen, Rambutan, Breadfruit, Coconut Palm, Cola nut,	Canistel, African Oil Palm, Mamey Sapote, Sapodilla, Cashew, Jaboticaba	Marula, Tamarind, Baobab, Cashew, Jujube	Temperates: apples, peaches, plums. White Sapote, Loquat, Macadamia Nut, Coffee	Passionfruit, Pineapple, Mulberry

Table 3: Characteristics of Tropical Fruits					
Culture		Economics	Nutrition		
Early-bearing	Slow growing	High economic value	Staple Crops	High caloric value	Rich in Vitamin A
Bunchosia, Strawberry Tree, Jackfruit, Guava, Surinam Cherry, Mulberry, Pineapple, Passionfruit, Soursop, Sugar Apple, Bananas and Plantains, grafted trees	Mangosteen, Jaboticaba, Lychee, Longan, Durian, Mamey, Tamarind, Baobab, Marula, many palms, most seedling trees.	Mangosteen, Durian, Lychee, Longan, Bananas, Citrus, Avocado, Mango, Jackfruit, Mamey, Coffee, Cacao, Pineapple, Rambutan, Cashew, Macadamia, Jujube	Banana, Plantain, Breadfruit	Avocado, Jackfruit (seeds, flesh), Canistel, Mamey, African Oil Palm, Durian, Safou, Cashew, Macadamia, Tropical Almond	Papaya, Mango, African Oil Palm, Mamey, Guava (red fleshed), Jackfruit

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