Relative Production of Palm Crops

<table>
<thead>
<tr>
<th>Crop</th>
<th>Production (1,000 mt)</th>
<th>Yield (mt/ha)</th>
<th>Production increase since 1980</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dates</td>
<td>6,283</td>
<td>5.7</td>
<td>144%</td>
</tr>
<tr>
<td>Coconut</td>
<td>50,858</td>
<td>4.7</td>
<td>56%</td>
</tr>
<tr>
<td>Oil Palm</td>
<td>127,383</td>
<td>12.2</td>
<td>333%</td>
</tr>
</tbody>
</table>

Tropical Horticulture - Texas A&M University

Vegetative Structure - Palms

- No cambium only growing point
- Growing condition record by sections, not annual rings
- Single trunk without branches
  - 50-120’ (up to 36.5m) tall
- Leaves - Date Palm
  - 10-20’ long
  - Life span of 3-7 years
- Roots surround leaf base

Tropical Horticulture - Texas A&M University

Fruiting

- Dioecious
- Pollinators - insects and wind
- Inflorescence - branched spadix
  - Many long spikes
  - Attached to fleshy axis
  - Enclosed in hard tough spathe
    - Burst open when flowers mature
  - Large inflorescence - 6,000 to 10,000 flowers

Tropical Horticulture - Texas A&M University

Origin of the Date Palm
(Phoenix dactylifera)

- Probably originated in Persia, Gulf region and spread
- This is one of the oldest cultivated plants

Zeven and de Wet, 1982

Tropical Horticulture - Texas A&M University
Origin

- Persian Gulf region
  - Especially between Nile and Euphrates rivers
  - Not known in wild
- Movement
  - West to Egypt and North Africa
  - East to Western India
- One of oldest cultivated plants
  - 8,000 years ago in South India
  - 4,000 BC in Arabia
  - Iraq (Ur) 3000 BC

Adaptation

- Hot arid climate with ample subsurface moisture
- Grows from 15° to 35° N latitude
  - Full sun
- Temperature
  - Dormant can take 20°F (-6.7°C)
  - Commercial growth
    - Mean daily maximum of 90°F (32.2°C)
- Moisture
  - Drought tolerant
  - High water requirement for maximum yield
    - 4-6 acre feet per year
    - Since lose 20%, apply 7.5 acre feet
  - Roots can withstand low O₂
    - Root structure permits O₂ movement from surface
  - No rain during ripening (checking = cracking)
- Tolerant of high levels of
  - Alkali
  - Salt

World Date Production

144% increase since 1980

<table>
<thead>
<tr>
<th>Year</th>
<th>Production (1,000 mt)</th>
<th>Yield (mt/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1962</td>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td>1968</td>
<td>2,000</td>
<td></td>
</tr>
<tr>
<td>1974</td>
<td>3,000</td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>4,000</td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td>5,000</td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>6,000</td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>7,000</td>
<td></td>
</tr>
</tbody>
</table>

FAOSTAT, 2003

World Date Yield

Yield has decreased since 1962

<table>
<thead>
<tr>
<th>Year</th>
<th>Date Yield (mt/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1962</td>
<td>8.0</td>
</tr>
<tr>
<td>1968</td>
<td>7.0</td>
</tr>
<tr>
<td>1974</td>
<td>6.0</td>
</tr>
<tr>
<td>1980</td>
<td>5.0</td>
</tr>
<tr>
<td>1986</td>
<td>4.0</td>
</tr>
<tr>
<td>1992</td>
<td>3.0</td>
</tr>
<tr>
<td>1998</td>
<td>2.0</td>
</tr>
</tbody>
</table>

FAOSTAT, 2003

Date Production

<table>
<thead>
<tr>
<th>Region</th>
<th>Production (1,000 mt)</th>
<th>Yield (mt/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>2,116</td>
<td>7.4</td>
</tr>
<tr>
<td>Asia</td>
<td>4,135</td>
<td>5.1</td>
</tr>
<tr>
<td>Latin America</td>
<td>4</td>
<td>4.4</td>
</tr>
<tr>
<td>USA</td>
<td>21</td>
<td>9.4</td>
</tr>
</tbody>
</table>

FAOSTAT, 2003
### World Date Production

<table>
<thead>
<tr>
<th>Region</th>
<th>Countries</th>
<th>Production (1,000s mt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>Algeria</td>
<td>413</td>
</tr>
<tr>
<td></td>
<td>Egypt</td>
<td>1,078</td>
</tr>
<tr>
<td></td>
<td>Sudan</td>
<td>260</td>
</tr>
<tr>
<td>Asia</td>
<td>Iran</td>
<td>874</td>
</tr>
<tr>
<td></td>
<td>Iraq</td>
<td>633</td>
</tr>
<tr>
<td></td>
<td>Oman</td>
<td>259</td>
</tr>
<tr>
<td></td>
<td>Pakistan</td>
<td>624</td>
</tr>
<tr>
<td></td>
<td>Saudi Arabia</td>
<td>767</td>
</tr>
<tr>
<td></td>
<td>United Arab Emirates</td>
<td>759</td>
</tr>
</tbody>
</table>

FAOSTAT, 2003

### Propagation

- **Seedlings**
  - Variable - 50% female
- **Must propagate from offshoots**
  - Date palm produce 2 offshoots per year
  - for 10-15 years
- **Harvest when 3-5 years old**
  - 40 - 75 lbs (18-34 kg)
  - Sledge hammer and chisel

### Planting

- **Density**
  - 120/ha
  - May lose up to 25% of planted offshoots
  - 1 male plant for 50 female plants
- **Precocity**
  - Blooms within 3 years
  - First commercial crop in 5-6 years

### Cultivars

- **1000s of cultivars in the world**
- **‘Zahdi’ (Semi-dry)**
  - Leading cv in Iraq
  - Oldest known cultivar
  - Very popular in the middleeast
- **‘Deglet Noor’ (Semi-dry)**
  - Introduced from Tunisia to California in 1900
  - 75% of California production
- **Medjool (Soft)**
  - From Morocco to California in 1927
  - Deluxe date grown in California and Arizona
  - Vary in ripening time (3 months) so generally several varieties are grown

### Pollination done by hand

- **Minimize number of male plants**
  - 1 male → 50 female trees
- **Ensure good set**
- **Methods**
  - Traditional - put ∑ strands on Ε flower
  - Pollen can be stored and dusted on
  - Metaxenia - male variety important
  - Pollen source affects maturity, seed shape, and seed size
**Hand Pollination**

- Female inflorescence

Traditionally done for thousands of years

**Fruit Development**

- About 29 weeks for development

- Chimri - 1st 17 weeks
  - Green, hard, bitter, 80% moisture, 50% sugars

- Khalal - weeks 18 to 23
  - Full size, yellow, orange or red color
  - % sugars increasing, mainly sucrose

- Rutab - weeks 24 to 27
  - Half ripe, soft apex and change to light brown

- Tamar - weeks 28 and 29
  - Hazel to dark brown
  - Wrinkled
  - Low respiration
  - Cells disorganized

**Fruit development**

- 29 weeks for fruit development

- Thinning female flowers
  - Common to leave 12 bunches per tree
  - Each bunch with 30 strands each with 30 fruit

**Fruit is thinned**

- To avoid alternate bearing
  - One year with heavy crop
  - Second year with small crop

**Hand Pollination**

- Male inflorescence

2-3 pieces tied to distal side of female inflorescence
Bearing Date Orchard

Harvesting Dates

Harvest Stages

Harvest early if cv non-astringent.
- Eaten in Khalal stage (firm - yellow)
- Boiled and dried
- Begin to pick soft and semidry types in Rutab stage
- Dry dates are picked in Tamar stage

Harvesting Techniques

Worker climbs tree
Khalal cut bunch and lower with rope
Fresh market fruit
- Begin when lower half in Rutab stage
  - 2-3 pickings then cut raceme
- Tamar stage
  - If uneven ripening, shake ripe onto mat
  - May pick 3-8 times
  - If wait until fully ripe cut bunch and drop on mat

In climates where high humidity is possible during harvest

Harvest early to avoid checking
- Semi dry varieties
- 6 days early
- Ripened artificially
  - 80° - 95° F heated room to complete ripening

Processing

Dry or cold storage
- Full mature store for 5-6 months
- Under ripe store for 10 - 18 months
- Store years in frozen state
Nutritional content
High energy food with good levels of Fe and K

- Content
  - Moisture: 7 - 26%
  - Protein: 2 - 4% (low)
  - Fat: 0.1 - 1.2% (low)
  - Sugar: 70 - 80%
    - Full ripe soft date: glucose & fructose
    - Semi-dry: half sucrose
- Traditionally eaten with milk products

Other products
- Cull dates are used for feed
- Seeds
  - Feed, charcoal, jewelry
- Leaves, petioles, inflorescences
  - Wide range of products
    - Woven into mats, baskets, crates, fans
    - Cellulose pulp, rope, hats, roofing, brooms
- Tap tree for sweet sap
  - Palm sugar, molasses, alcoholic drinks
  - Other palms also tapped

Tropical Oil Seed Crops

- Coconut
- African Oil Palm

Vegetable Oil Production in 1961-1963

Vegetable Oil Production in 1979-1981

Vegetable Oil Production in 2000-2002
Vegetable Oil Production in 1962, 1980, and 2001

Oil quality per 100 gm

<table>
<thead>
<tr>
<th></th>
<th>Saturated</th>
<th>Mono unsaturated</th>
<th>Poly unsaturated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palm Oil</td>
<td>49</td>
<td>37</td>
<td>9</td>
</tr>
<tr>
<td>Palm kernel</td>
<td>82</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>Coconut</td>
<td>87</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Peanut</td>
<td>17</td>
<td>46</td>
<td>32</td>
</tr>
<tr>
<td>Soybean</td>
<td>14</td>
<td>23</td>
<td>58</td>
</tr>
<tr>
<td>Olive</td>
<td>14</td>
<td>48</td>
<td>33</td>
</tr>
</tbody>
</table>

Coconut

- **Palmae**
- **Cocos nucifera**

One of 10 most useful trees in the world
- 50 million people make living from the coconut tree
- 96% world's coconut crop on small plots (<4 ha)

Coconut tree is a monocot

- Tall
  - Up to 100’ (35 m)
  - No branches, only one growing point
- Crown of 20-30 pinnate leaves
  - Leaves compound - “feather like”
  - 0.6 to 1 m long
  - Take 1.5 years to reach full size
  - Live more than 2 years

Flowering

- Monoecious and dichogamous
- Inflorescence (2-4’ long)
  - Up to 8,000 small (1-2 mm) R flowers
  - 1-30 F flowers near base
  - Nectar attract bees and other insects
  - One inflorescence produced from leaf axil per month
- Flowers in 5-8 years (dwarf in 3-4 years)
**Dichogamy**

- Protandrous thus cross-pollinated
  - Male flowers 2 weeks before the female
  - Pollen comes from another plant
- Pollination
  - Bees appear to be main pollinator
  - Other insects: ants, wasps, earwigs, flies
  - Some wind pollination

**Fruit**

- Develops 12 crops at same time
  - Maturation takes 1 year
  - One tree can mature 100 nuts/year
  - Drops 65 - 70% of immature fruit
- Growth stages
  1) Rapid growth of husk
  2) Enlargement of cavity & filling with liquid endosperm
  3) Solid endosperm in 5 - 6 mos

**Origin and Dispersal of Coconut**

- No truly wild coconuts are known
  - Spread by floating in oceans and human movements
- Southeast Asia
  - Spread east to Pacific islands and Americas
  - Spread west to India and East Africa
- Americas
  - First arrived on Pacific shores from Pacific Islands
  - In 15th century or later to Atlantic shores from West Africa

**Adaptation**

- Lowland wet tropics
  - Up to 900 m
  - 27 - 35°C
  - Very small diurnal variation
  - Minimum rainfall
    - 1250 mm (52”)
  - High sunlight
Adaptation

- Characteristic of coastal sands
- Need source of fresh water
- Tolerant of salt spray
- Tolerant of high winds
- High winds make unprofitable
- Use windbreaks

World Coconut Production

- 56% increase since 1980

World Coconut Yield

- Yield unchanged since 1962

Coconut Production

<table>
<thead>
<tr>
<th>Region</th>
<th>Production (1,000 mt)</th>
<th>Yield (mt/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>1,751</td>
<td>2.7</td>
</tr>
<tr>
<td>Asia</td>
<td>43,110</td>
<td>4.8</td>
</tr>
<tr>
<td>Latin America</td>
<td>4,287</td>
<td>6.7</td>
</tr>
</tbody>
</table>

World Coconut Production

<table>
<thead>
<tr>
<th>Region</th>
<th>Countries</th>
<th>Production (1,000 mt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>Tanzania</td>
<td>376</td>
</tr>
<tr>
<td></td>
<td>Ghana</td>
<td>315</td>
</tr>
<tr>
<td></td>
<td>Mozambique</td>
<td>265</td>
</tr>
<tr>
<td></td>
<td>Ivory Coast</td>
<td>243</td>
</tr>
<tr>
<td>Asia</td>
<td>Indonesia</td>
<td>78,427</td>
</tr>
<tr>
<td></td>
<td>Philippines</td>
<td>13,295</td>
</tr>
<tr>
<td></td>
<td>India</td>
<td>8,312</td>
</tr>
<tr>
<td></td>
<td>Sri Lanka</td>
<td>2,126</td>
</tr>
<tr>
<td></td>
<td>Thailand</td>
<td>1,397</td>
</tr>
<tr>
<td>Americas</td>
<td>Brazil</td>
<td>2,259</td>
</tr>
<tr>
<td></td>
<td>Mexico</td>
<td>1,059</td>
</tr>
</tbody>
</table>

Propagation

- Exclusively by seed
- Select best trees to use as seed source
- Uniform growth, straight trunk
- Closely spaced leaf scars
- Dense crown
- Short, capable of holding heavy fruit crop
- 10 year production record
**Seed Bed**
- Use fully mature nuts
  - Soak in water for 1 - 2 wks
  - Cut exocarp & mesocarp distal end
- Plant in a nursery
  - 20 - 30 cm apart in rows 20 cm apart
  - Nuts horizontal with eye up

**Placement of Coconut for Planting**
- Shoot appears within 16 weeks of planting
- Pedicel attachment point
- Cut end of coconut

**Nursery care**
- Rogue out seedlings
  - Slow germination
  - Slow growth
  - 25 - 30 weeks in the nursery
  - 3-4 leaf stage
  - Planted into permanent orchard

**Planting**
- Density
  - 9-10 m square or triangular system
  - 70-150 trees per ha
- Precocity
  - First commercial harvest, 5-9 years
  - Full production after 12-13 years
  - Productive for 60 years

**Harvesting & Processing**
- Harvesting
  - Climb trees - 25 palms per day
  - Poles - 250 palms per day
  - Allow to fall and pick up regularly
- Harvest time
  - Immature for “milk”
  - 1 month before ripe for coir
  - Mature for copra/oil

**Thousands of uses of the coconut**
- Food
- Oil
- Feed
- Fiber
- Fuel
- Wood
Copra Production
- Coconuts split and dried
  - Dried endosperm (meat) = copra
  - 6% moisture and 70% oil
  - Various extraction procedures
  - Resulting “cake” used for feed
- Uses of oil
  - Soaps, shampoos, toothpaste, ice cream
  - Lubricants, paints, plastics

Palm Oil
- Palmae
  - Elaeis guineensis

Vegetative Structure
- Tall, erect palm without branching
  - 8.3-35 m
  - No offshoots like coconut
- Leaves
  - 4 to 10’ (1.3 to 2.3 m) long
  - Hooked spines on petioles
  - 4-5 yr trees may produce 30 leaves/yr
  - 10th yr produce 20 leaves/year

Tree Height
- May become 100’ (35m) tall
- Harvest?
- Answer - cut down on 20th yr
- To facilitate harvest

Flowers
- Monoecious
  - Male and female inflorescences
    - 1 male to 120 female inflorescences
    - Packed in leaf axils
  - Complete dichogamy common
    - Cross pollination is usual
  - Pollen airborne ~ 100’
    - Can store dessicated for 10 weeks
  - Pistil receptive 3 days

Oil Palm Flowers - leaf axil
- From The Oil Palm, FAO, 1970
**Female flowers**

- Green color at pollination
- Parts exposed to sun - purple
- Last 6 wks - yellow

**African Oil Palm fruit is a Drupe**

- Matures 6 months after pollination

  - Mesocarp
    - Pulp, ivory white
    - Rich in oil
  - Endocarp
    - Shell
    - Kernel
    - Seed
    - Rich in oil

**Origin of Oil Palm**

*(Elaeis guieensis)*

- Fruit turn black when ripe with red at base
- Inflorescences from leaf bases
- Matures 6 mos after pollination
- Harvest throughout the year
- Clusters weigh 20 - 100 lbs.

**Origin of African Oil Palm**

- Rainforest/savanna transition zone of West Africa
- 300 km wide coastal belt from Liberia to Angola
- Maintained as semi wild populations
- Used by local populations for centuries
- Major source of vitamin A
- Mid 1800s was moved to Sumatra and Java
- 1917 was established in Malaysia

**Adaptation**

- Transition zone between rain forest and savanna
- Riverine forests
- Fresh water swamps

**Temperature**

- Mean monthly maximum - 30-32C
- Mean monthly minimum - 21-24C
- No growth < 15C

**Moisture**
**Adaptation**

- **Moisture**
  - High rain fall
  - 1,780 to 2,280 mm
- **Tolerate**
  - Temporary flooding
  - Fluctuating water table
- **Soil**
  - Tolerate wide range of soils

---

**World Oil Palm Production**

333% increase since 1980

---

**World Oil Palm Yield**

320% increase since 1962
174% increase since 1980

---

**Oil Palm Production**

<table>
<thead>
<tr>
<th>Region</th>
<th>Production (1,000 mt)</th>
<th>Yield (mt/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>15,294</td>
<td>3.7</td>
</tr>
<tr>
<td>Asia</td>
<td>104,450</td>
<td>18.1</td>
</tr>
<tr>
<td>Latin America</td>
<td>6,913</td>
<td>15.0</td>
</tr>
</tbody>
</table>

---

**World Oil Palm Production**

<table>
<thead>
<tr>
<th>Region</th>
<th>Countries</th>
<th>Production (1,000 mt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>Nigeria</td>
<td>8,407</td>
</tr>
<tr>
<td></td>
<td>Ivory Coast</td>
<td>1,524</td>
</tr>
<tr>
<td></td>
<td>Ghana</td>
<td>1,050</td>
</tr>
<tr>
<td></td>
<td>Cameroon</td>
<td>1,050</td>
</tr>
<tr>
<td>Asia</td>
<td>Malaysia</td>
<td>60,983</td>
</tr>
<tr>
<td></td>
<td>Indonesia</td>
<td>38,227</td>
</tr>
<tr>
<td></td>
<td>Thailand</td>
<td>3,746</td>
</tr>
<tr>
<td>Americas</td>
<td>Colombia</td>
<td>2,573</td>
</tr>
<tr>
<td></td>
<td>Ecuador</td>
<td>1,317</td>
</tr>
<tr>
<td></td>
<td>Honduras</td>
<td>874</td>
</tr>
<tr>
<td></td>
<td>Costa Rica</td>
<td>656</td>
</tr>
</tbody>
</table>

---

**Propagation**

- Exclusively by seed
  - Parents selected according to seedling performance
- Germination
  - Best at high temperatures
  - Germinate in 90 days
  - Grow in container for 4-5 months
  - Grow in nursery for 12 months

---

*From The Oil Palm, FAO, 1970*
**Propagation**

- Transplantation
  - 16-18 months old
  - 15 leaves

**Planting**

- Density
  - 75-150 palms per hectare
  - Common to intercrop the first several years
- Precocity
  - After 3-4 years begin to fruit

**Three Varietal Groups**

- Dura, 2-8 mm endocarp
  - Pulp, 35-55%
  - Kernel, 7-20%
- Tenera, 0.5-3 mm endocarp
  - Pulp, 60-95%
  - Kernel, 3-15%
- Pisifera, no shell
  - Fruit frequently rot prematurely

**Ripe fruit turns black**

- Dura palm fruit
  - Thicker shell
- Tenera palm fruit
  - Less thick shell
- Pisifera palm fruit
  - No shell

**Harvesting**

- Harvest throughout the year
  - Every 5 - 10 days look for ripe bunches
  - If too early - less oil
  - If over ripe - lower oil quality
- Harvest bunch
  - Fruit black with red base
  - Cut off entire bunch (20-100 lbs)
  - 100-150 bunches/ man/day
**Harvesting - Yields**

- **Semi wild**
  - 1.2 to 5 mt fruit/ha/yr
- **Estate in Africa**
  - 7.5 to 15 mt fruit/ha/yr
- **Estate in Sumatra/Malaysia**
  - 15 to 25 mt fruit/ha/yr

**Oil Extraction Percentage**

- **Mesocarp**
  - Soft press, 8%
  - Hydraulic press
    - Dura, 15-18%
    - Tenera, 20-22%
- **Kernel**
  - 3.5 to 5%

**Palm Oil from Pericarp**

- As mature the carbohydrates convert into oil
- Oil quality improves with maturity
- Level of free fatty acids increase with maturity
  - Free fatty acids have rancid flavor
  - At full ripe FFA is < 0.3%
  - 5% FFA is acceptable
- Harvest every 5-10 days

**Processing**

- Enzyme inactivated with steam
  - Prevents FFA formation
- Pericarp crushed separated from nuts
- Pressed to separate oil
- Nuts dried from 25 to 12% moisture
  - Cracked - separated from shells
    - Dried to 8% moisture
    - Shipped to processor who separate oil

**Other palms**

**Snake fruit or Salak**

- **Arecaceae**
- **Salacca zallaca**
Salak palm

- Small cluster palm
  - No stem or trunk
  - Sprouts leaves from ground
  - Spines on fronds
  - Usually shorter than 5 m
- When reach certain height
  - Grow by spreading on soil surface
  - Forms suckers on side of palm

Snake fruit in Thailand

- Spines on fronds

Snake fruit in Thailand

- Grow by spreading on soil surface

Snake fruit in Thailand

- Grows to about 5 m tall

Dioecious plant

- Requires cross pollination for good set
  - This ensured by placing male inflorescence on female inflorescence
- Fruit develop in bunches
  - Bagged to protect against rats and other pests
**Fruit**
- Formed in bunches from leaf axils
- Fruit - 6 months to mature
  - Reddish brown, scaley skin
  - Immature fruit very acid - poor quality
- Flesh of ripe fruit
  - Firm, white, fibrous
  - Sweet-acid taste, crisp
  - Strawberry, pineapple
  - 1-3 seeds per fruit
  - Robust fruit, difficult to bruise
  - Excellent shipper
  - Shelf life at 25°C is one week

**Origin**
- Indigenous throughout Indo-Malaysian region

**Adaptation**
- Tropical
  - High temperature and humidity
  - Frost sensitive
  - Sun sensitive especially young plants
  - Need continuous supply of moisture
- Soil
  - Sandy clay soils high in organic matter
  - Good aeration and drainage

**Propagation**
- Normally done by seed
  - Cleaned and soaked overnight
  - Planted in sand
  - After 6-8 weeks planted into poly bags
  - Need to shade to avoid sunburn
  - Can propagate by suckers as well

**Planting**
- Density
  - 3m x 6m
  - 555 plants/ha
  - Need temporary shade to establish
    - Initially 70-80%, after 1 year 40-50%
    - Can use banana or Grillicidia
- Precocity
  - Begin to fruit in 3-4 years

**Snake fruit in Thailand**
Harvesting

- Produced at frequent intervals throughout the year
- Peak June-July and October-November
- Important not to pick immature because of high acidity
- Harvest bunch
- Yield
  - 10 mt/ha/year

Snake fruit in Thailand

Any Questions??