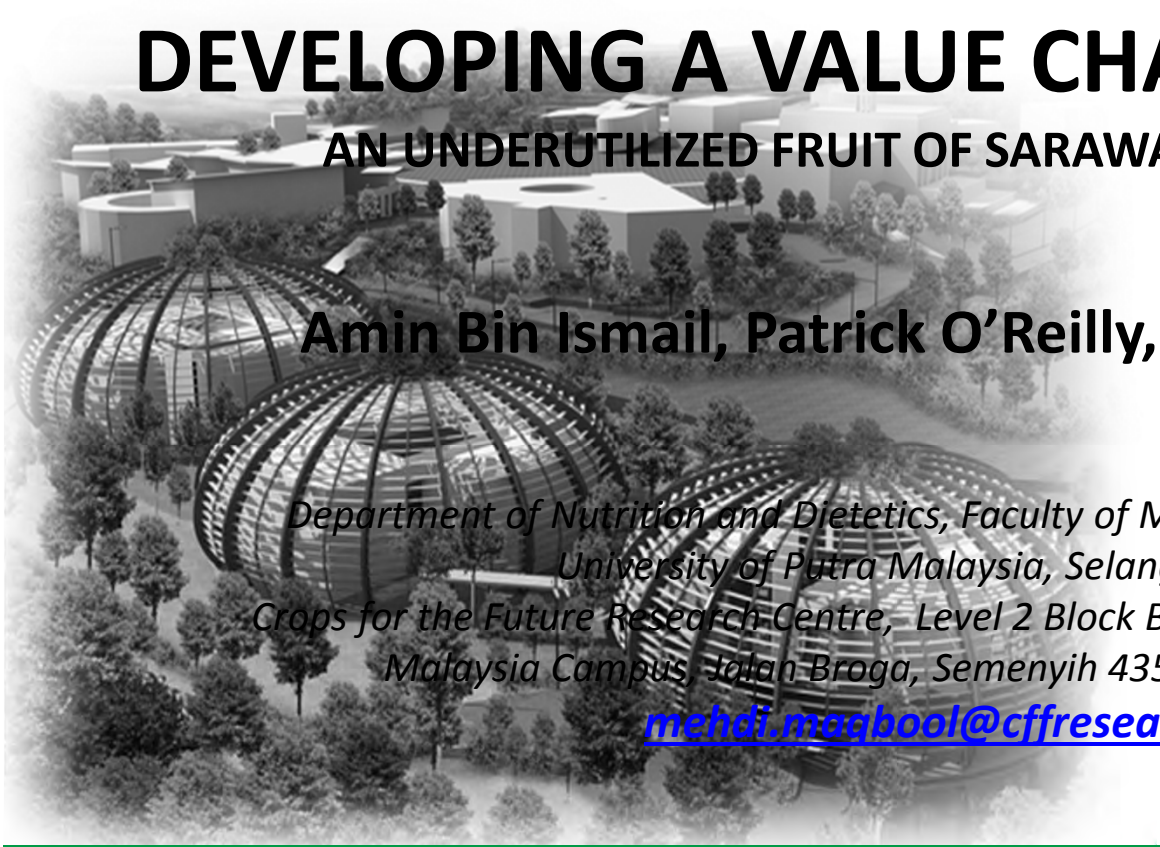
*3rd International Conference on Neglected and Underutilised Species*
*Accra, Ghana, 25-27 September 2013*

# DEVELOPING A VALUE CHAIN FOR DABAI:

## AN UNDERUTILIZED FRUIT OF SARAWAK, EAST MALAYSIA



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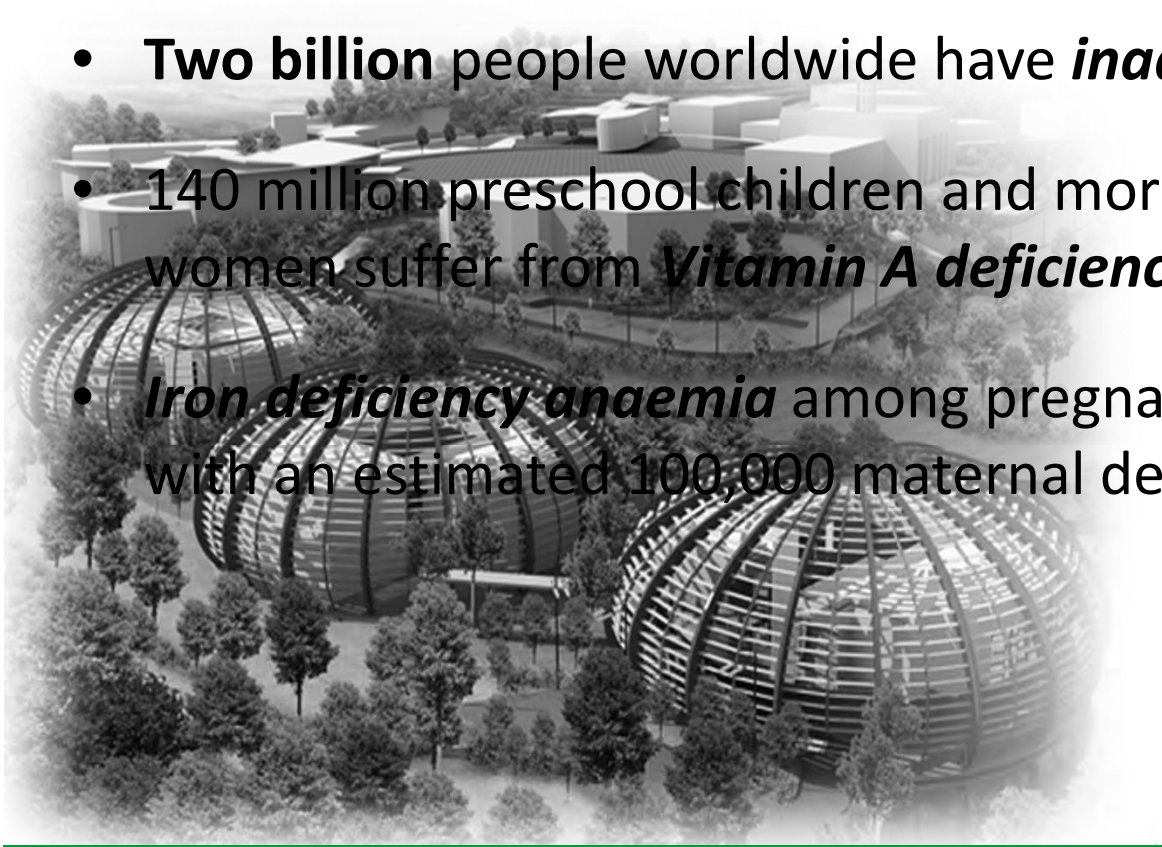
# World Food and Nutrition Security – Key Facts

- 842 million people worldwide ***suffer from hunger or undernourishment.***
- **Two billion** people worldwide have ***inadequate iodine nutrition.***
- 140 million preschool children and more than 7 million pregnant women suffer from ***Vitamin A deficiency.***
- ***Iron deficiency anaemia*** among pregnant women is associated with an estimated 100,000 maternal deaths every year.



FAO, 2004; UN SCN, 2004; WHO, 2010

# Problem Statements

## Problem 1: Lack of Dietary Diversity

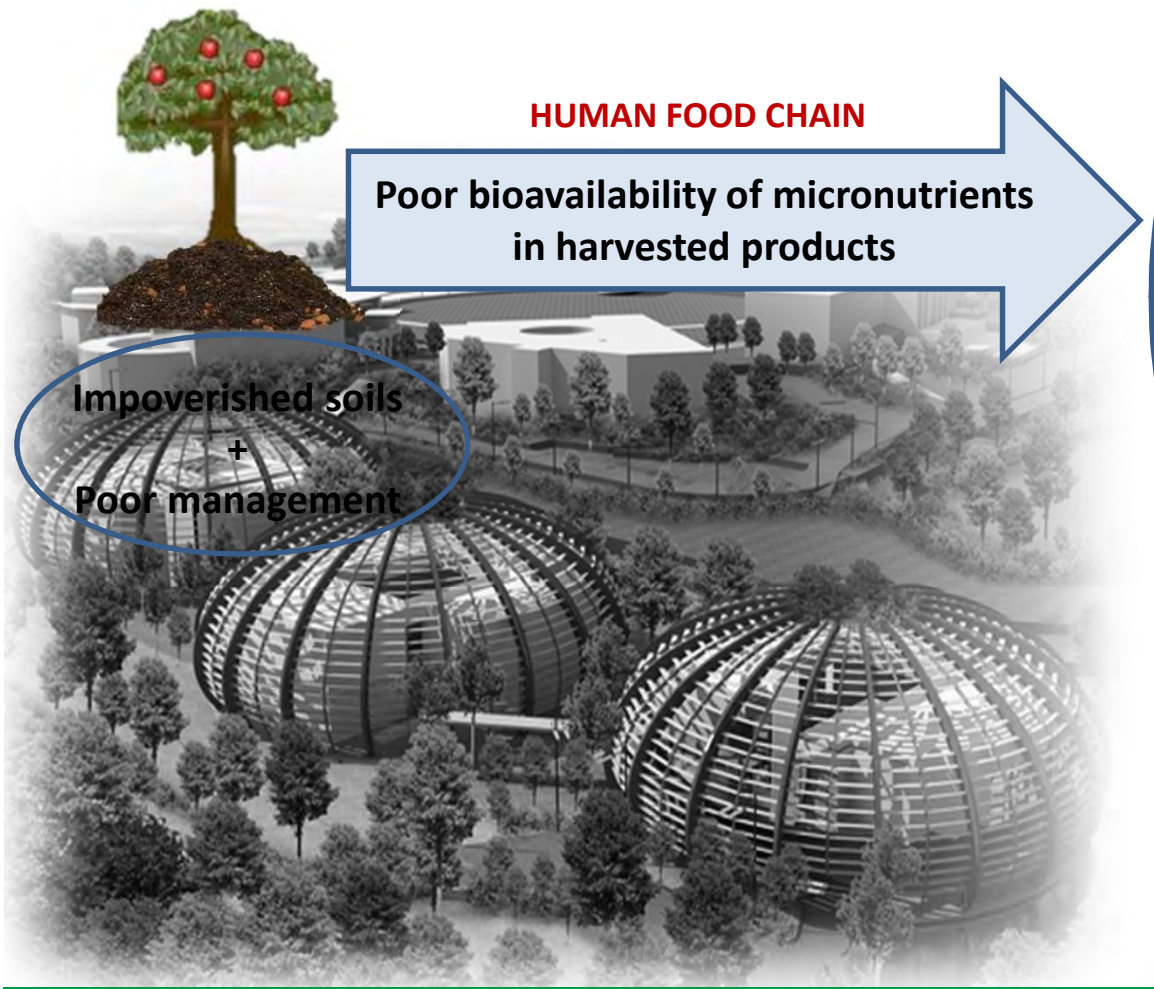
- **Wheat**
- **Rice**
- **Maize**
- Potato
- Cassava
- Soybean
- Sweet Potato
- Sorghum
- Yam
- Plantain

***More than half of the world's food.***

**Ten crops account for more than 75% of the food consumed in the world.**

(International Development Research Centre, 2006)

# Problem 2: Poor Availability of Micronutrients



Impoverished soils
+
Poor management

HUMAN FOOD CHAIN

Poor bioavailability of micronutrients in harvested products

Malnutrition

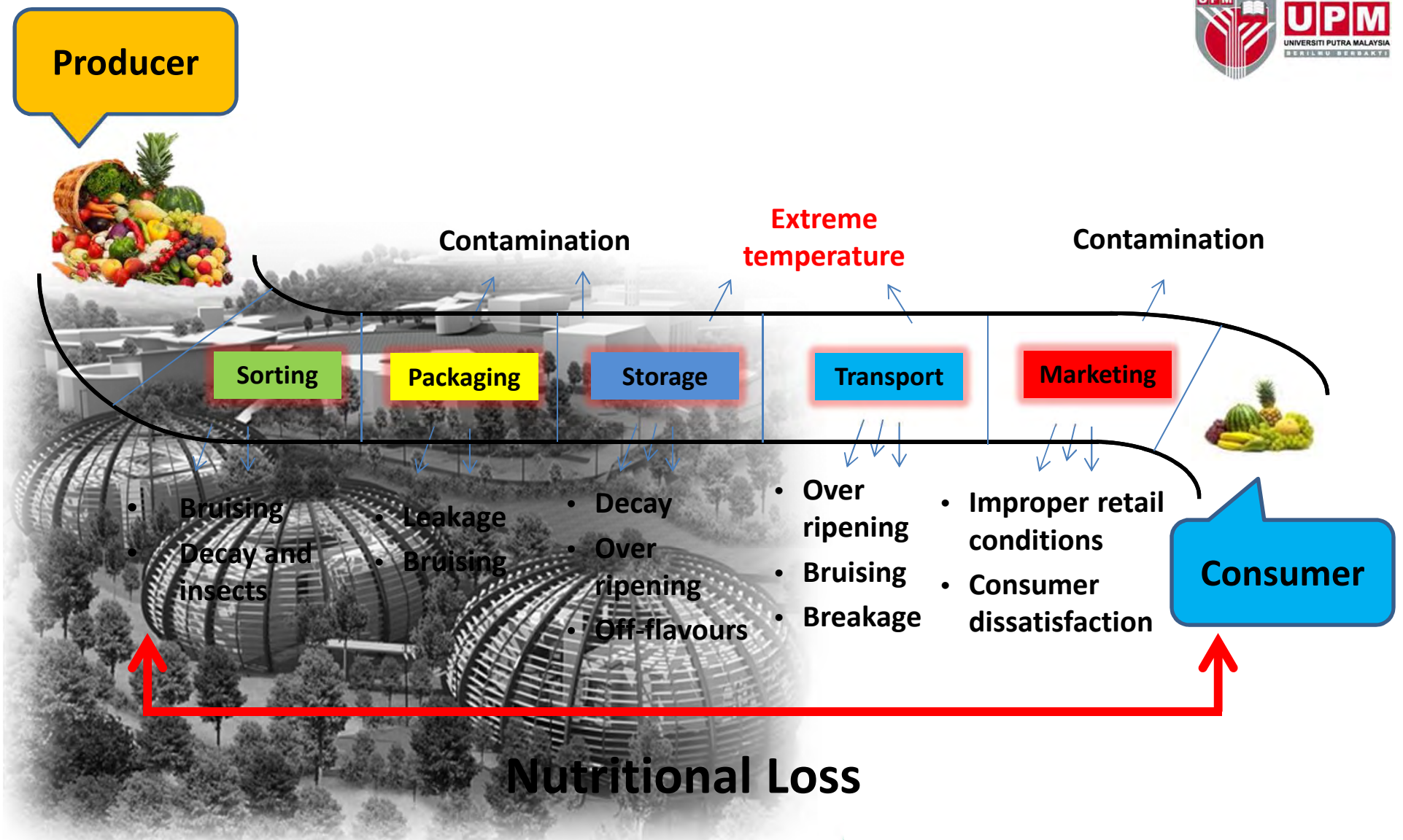
**Children:**

- Poor physical and mental development

**Adults:**

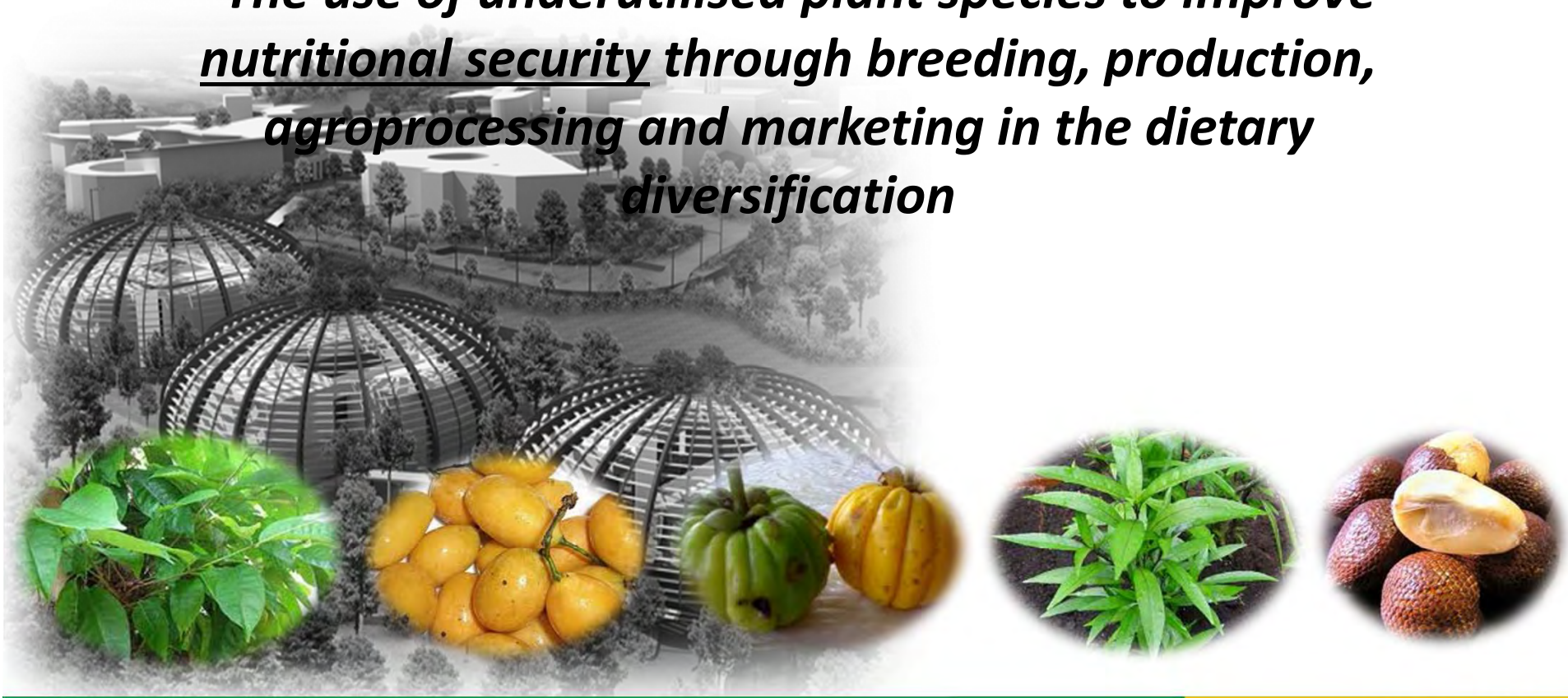
- Frequent illness
- Poor pregnancy outcomes
- Loss of learning potential

# Problem 3: Postharvest Nutritional Losses



# FoodPLUS Programme – going back to basics

***"The use of underutilised plant species to improve <u>nutritional security</u> through breeding, production, agroprocessing and marketing in the dietary diversification***

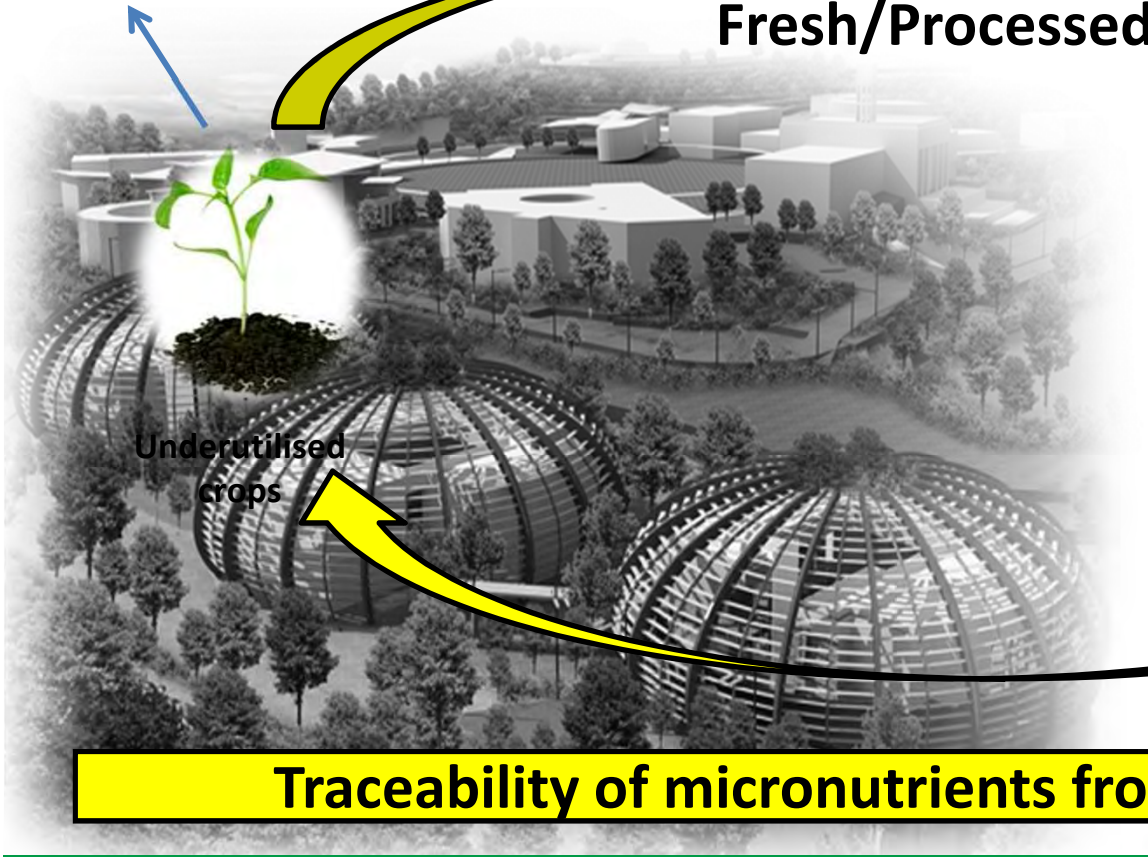


# FoodPLUS Strategy in a Nutshell

- Postharvest physiology
- Processing and preservation
- Supply chain management

***Biofortification***
**Soil + Breeding**

**Fresh/Processed**



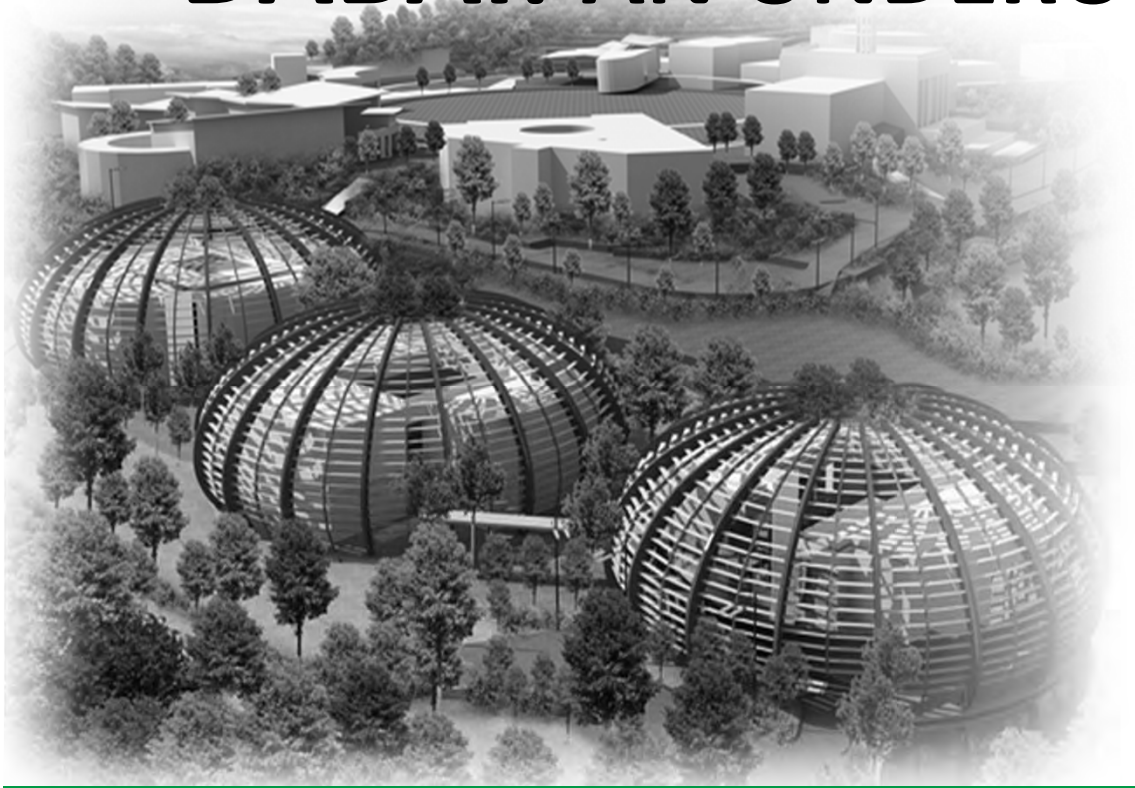
**Underutilised crops**

**End user**

- ***Bioavailability*** **of micronutrients**

**Traceability of micronutrients from soil → End user**

# DABAI: AN UNDERUTILISED FRUIT



# Dabai - Introduction

**Local name:** Dabai/Sibu olive

**Botanical name:** *Canarium odontophyllum* Miq.

**Family:** Burseraceae

# Dabai - Introduction

# Dabai - Introduction

- Seasonal in nature (July, August – October, November).
- Ripe fruit is soaked in warm water for 3-5 min for softening.
- Tastes like an avocado.
- Consumed seasoned with sugar, salt, pepper or sauce.
- Stony hard seed is discarded.

# Dabai - Introduction

- *Canarium* is the genus of about 75 species of tropical and subtropical trees.
- Several species are important for their edible pulp.
- Some other species have edible kernel.
- Few species are important for their oily resin which is tapped from the trunk.
- Five other species are of economic importance:
  1. *Canarium album*
  2. *Canarium schweinfurthii*
  3. *Canarium ovatum*
  4. *Canarium indicum*
  5. *Canarium harveyi*

# *1. Canarium album*

- Native to the southeast area of China
- Named the ‘Chinese olive’
- Fresh fruits are edible
- Processed into beverages and confections
- Kernels are discarded
- Dried fruits are used to cure pain and swelling of the throat
- 20 phenolic compounds have been identified in the fruit pulp

# *2. Canarium schweinfurthii*

- Distributed throughout tropical Africa
- Known as ‘African Black Olive’
- Boiled fruit pulp is sold as food
- Fruit pulp oil is extracted and used for cooking
- Consumption of the fruit pulp oil has been associated with positive effects on blood lipids profile, lipid peroxidation and oxidative stress in rats

# *3. Canarium ovatum*

- Indigenous to the Philippines
- The most important nut producing species
- Kernel is the most important part of the fruit, locally known as ‘pili’ nut or ‘pilaui’
- Crispy when eaten raw
- Frequently used as an ingredient in cakes, puddings and chocolate-making
- Boiled ripe pulp is usually eaten with sauces

# 4. *Canarium indicum*

- Native to Eastern Indonesia

# 5. *Canarium harveyi*

- Native to the Solomon Islands, Vanuatu, Fiji, Tonga, and Niue

# Dabai - Nutritional Composition

Sample collection:

Purple fruits:

- Kanowit
- Kapit
- Song

Red fruits:

- Sarikei

**Purple fruits**

**Red fruits**

- Proximate analysis (Moisture, ash, protein, lipid, total available carbohydrate)
- Mineral composition
- Amino acids composition
- Fatty acids composition

# 1. Proximate analysis

| Nutritional composition* | Purple fruits | | | Red fruits |
|---|---|---|---|---|
| | Kanowit | Kapit | Song | Sarikei |
| Moisture | 51.30±0.93[a] (50.13-52.97) | 51.11±1.10[a] (49.26 | 51.70) | 51.91±0.88[a] (50.92-52.60) |
| Total available carbohydrate | 4.45±0.83[b] (3.57-5.50) | 5. (3.8 | [a] .51) | 9.16±0.15[a] (8.99-9.27) |
| Protein | 5.20±0.87[a] (3.75-6.22) | 4.56±0.87[a,b] (3.08-5.65) | 4.35±1.15[a,b] (2.69-6.68) | 3.45±0.64[b] (2.78-4.04) |
| Lipid | 25.76±3.03[a] (22.30-29.51) | 21.16±4.71[a] (14.57-26.01) | 24.47±2.76[a] (20.91-29.04) | 23.72±1.11[a] (23.08-25.01) |
| Ash | 1.89±0.08[a] (1.77-1.95) | 1.88±0.42[a] (1.46-2.42) | 1.66±0.26[a] (1.34-2.00) | 1.78±0.17[a] (1.66-1.90) |

Papaya: 4.30

*g/100g fresh weight. Results are expressed in means ± standard deviation and (range).
Values with different letters are significantly different at $p<0.05$ within the same row.

# 2. Minerals composition

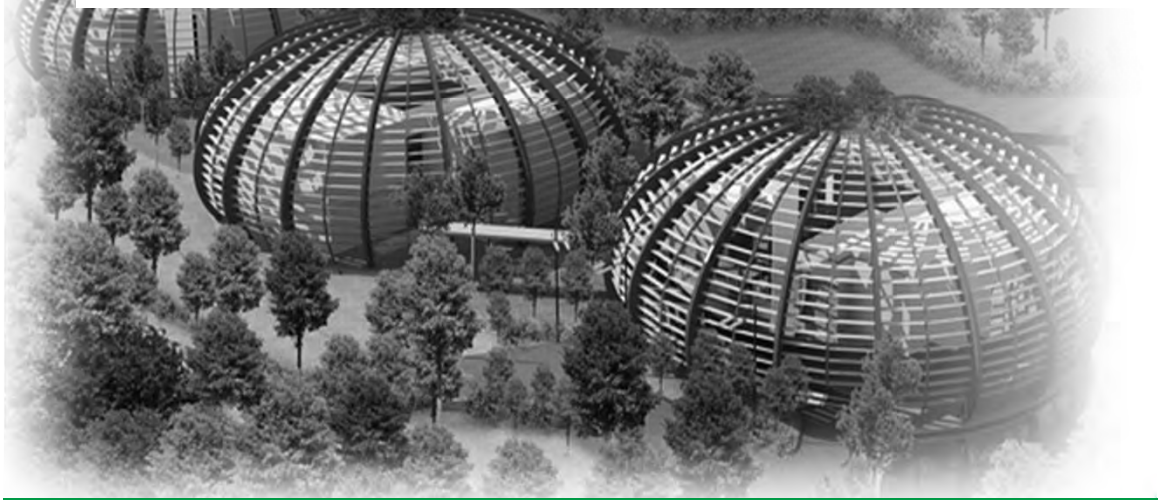
| Minerals* | Purple fruits | | | Red fruits |
|---|---|---|---|---|
| | Kanowit | Kapit | Song | Sarikei |
| Magnesium | 80.31±3.97[a] (76.51-84.51) | 74.67±15.36[a] (56.26-93.23) | 76.09±24.07[a] (50.04-102.07) | 62.72±0.38[a] (62.38-63.25) |
| Calcium | 28.47±1.56[a] (26.87-30.08) | 40.52±16.66[a] (22.90-61.94) | 43.72±22.72[a] (16.00-67.88) | 40.60±0.11[a] (40.50-40.74) |
| Sodium | 8.77±0.34[b] (8.47-9.50) | 12.05±3.45[a] (7.26-15.91) | 10.77±0.31[a,b] (10.13-11.19) | 9.36±0.05[b] (9.28-9.41) |
| Potassium | 6.80±0.21[a,b] (6.50-7.19) | 6.93±1.71[a] (4.84-9.06) | 5.29±1.10[b,c] (3.64-6.76) | 5.02±0.13[c] (4.85-5.16) |
| Iron | 3.10±0.49[a] (2.58-3.60) | 3.14±0.26[a] (2.76-3.44) | 2.10±0.09[b] (1.93-2.18) | 2.80±0.04[a] (2.76-2.84) |
| Zinc | 0.78±0.18[b] (0.61-0.95) | 0.81±0.05[a,b] (0.74-0.86) | 0.77±0.09[b] (0.66-0.87) | 0.92±0.01[a] (0.91-0.93) |
| Copper | 0.47±0.06[a] (0.42-0.53) | 0.35±0.14[a] (0.24-0.55) | 0.39±0.04[a] (0.32-0.44) | 0.21±0.00[b] (0.20-0.21) |

*mg/100g fresh weight. Results are expressed in means±standard deviation and (range).
Values with different letters are significantly different at $p<0.05$ within the same row.

# 3. Amino acids composition

| Amino acids* | Purple fruits | | | Red fruits |
|---|---|---|---|---|
| | Kanowit | Kapit | Song | Sarikei |
| Essential | 28.41±0.76[a] (27.32-28.94) | 26.91±2.93[a] (22.64-29.76) | 29.22±1.05[a] (27.76-30.62) | 30.16±0.62[a] (29.72-30.60) |
| Non-essential | 71.59±0.76[a] (71.07-72.69) | 73.09±2.94[a] (70.23-77.37) | 70.79±1.05[a] (69.39-72.24) | 69.85±0.62[a] (69.41-70.29) |

*% of total amino acids. Results are expressed in means±standard deviation and (range).
Values with different letters are significantly different at $p<0.05$ within the same row.



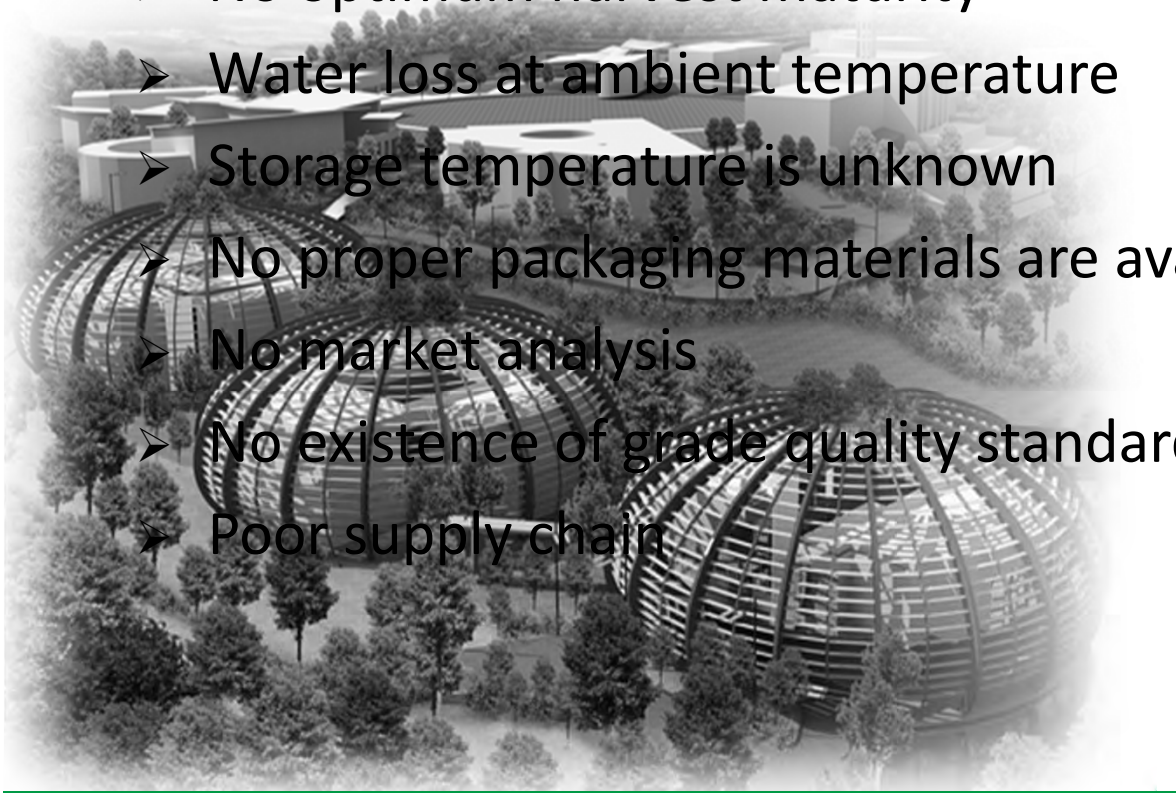
# 4. Fatty acids composition

| Fatty acids* | Purple fruits | | | Red fruits |
|---|---|---|---|---|
| | Kanowit | Kapit | Song | Sarikei |
| Saturated | 41.16±0.53[a] (40.69-41.63) | 40.92±0.54[a] (40.23-41.36) | 42.06±2.69[a] (39.29-46.13) | 41.16±0.04[a] (41.13-41.18) |
| Monounsatured | 41.83±0.58[a] (41.32-42.34) | 43.15±0.28[a] (42.81-43.45) | 41.54±3.02[a] (37.47-45.32) | 39.77±0.01[a] (39.76-39.78) |
| Polyunsatured | 17.01±0.06[b] (16.95-17.06) | 15.93±0.32[b] (15.62-16.33) | 16.40±1.13[b] (15.38-18.12) | 19.09±0.04[a] (19.06-19.11) |

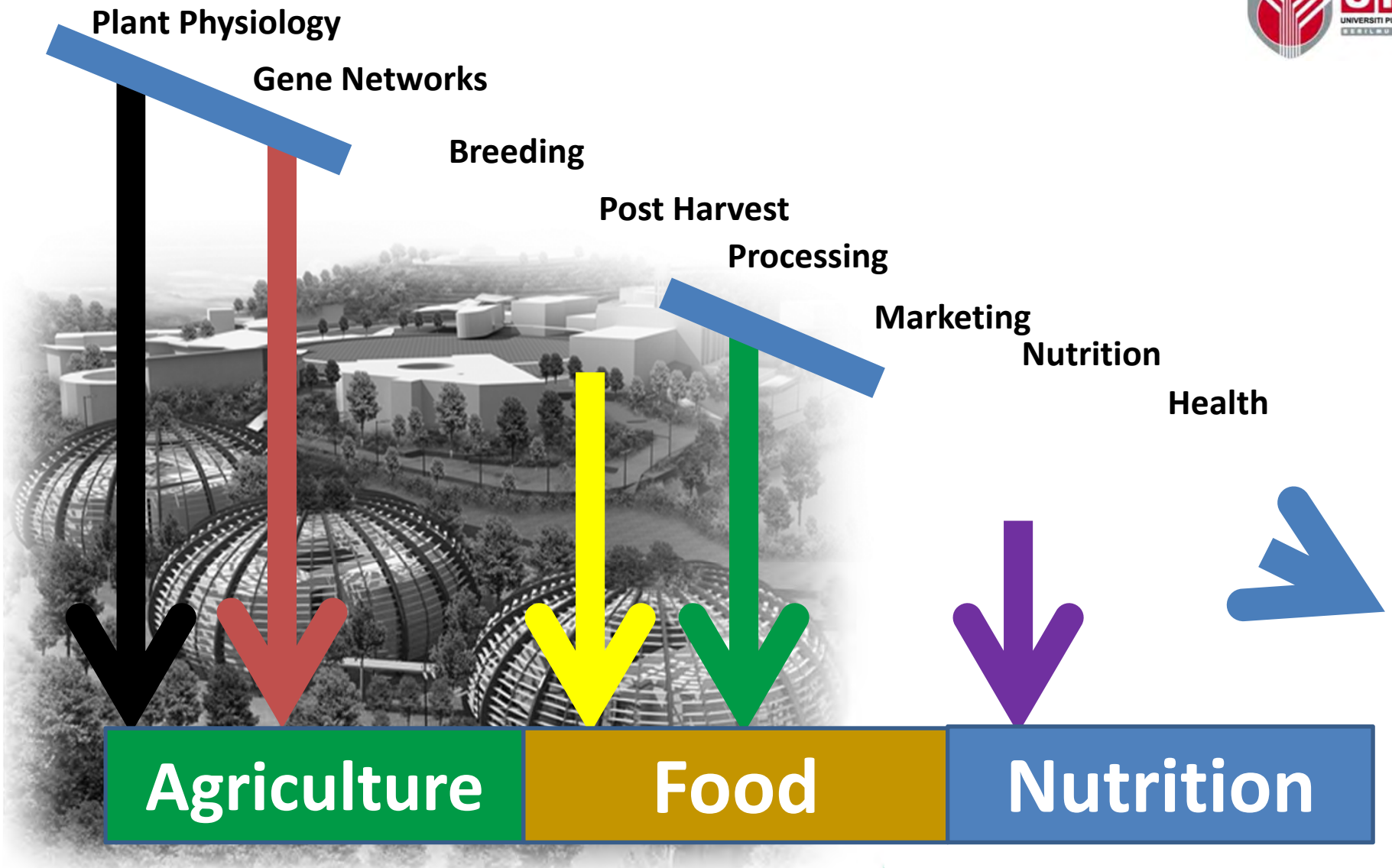
*% of total fatty acids. Results are expressed in means±standard deviation and (range).
Values with different letters are significantly different at $p<0.05$ within the same row.

# Constraints?

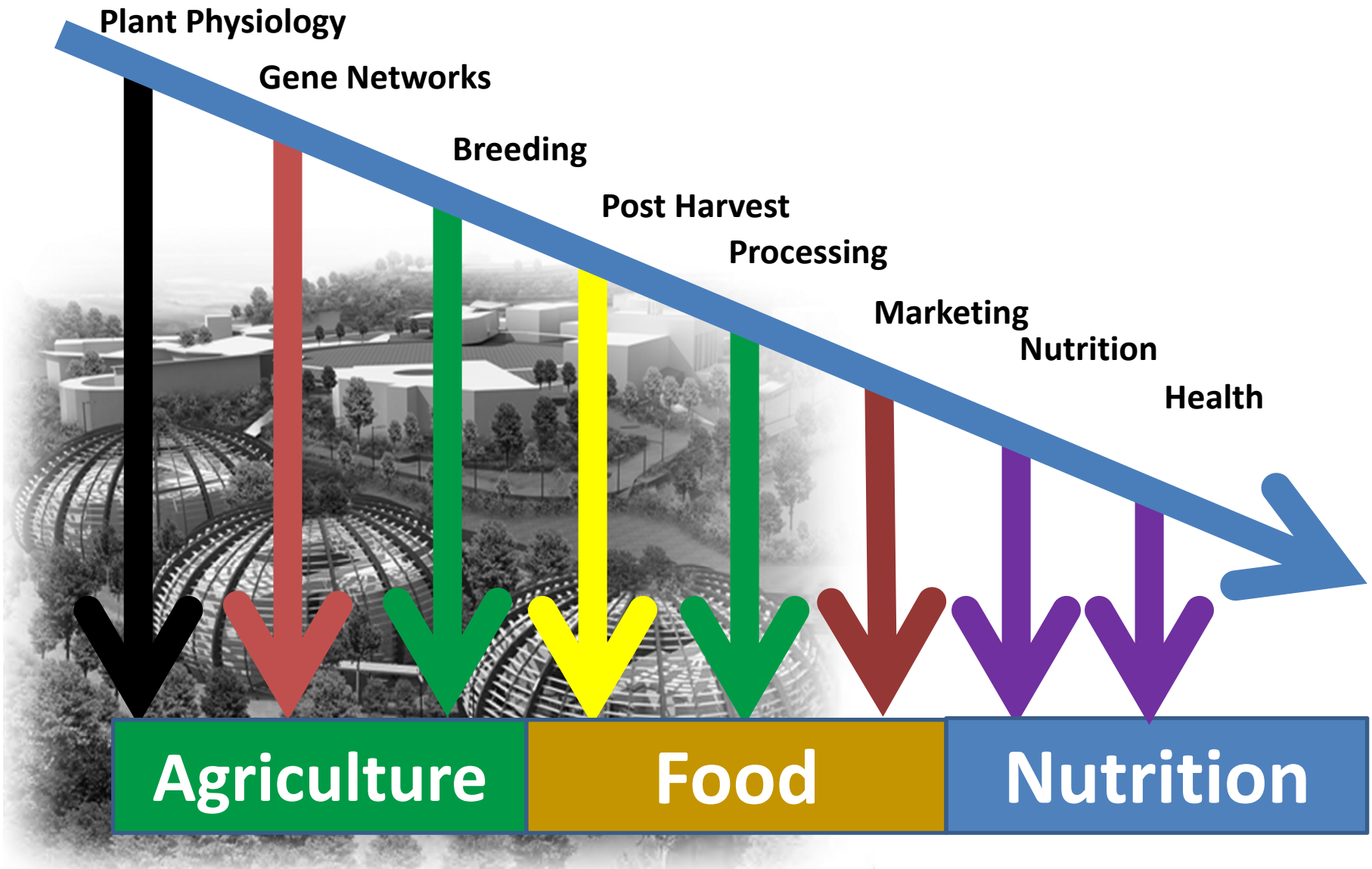
- Short shelf life (2 days)
- Seasonal variation in yield
- Fruit harvesting problem (tree is 30m height)
- No optimum harvest maturity
- Water loss at ambient temperature
- Storage temperature is unknown
- No proper packaging materials are available
- No market analysis
- No existence of grade quality standards
- Poor supply chain



# Current Scenario - Incomplete Value Chain



# Addressing the Knowledge Gaps



# Thank you

# Have a fruitful day