

Postharvest and Processing of Sweet Potato: (a case study from Papua New Guinea)



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Food and Agriculture in PNG

❑ Agriculture, forestry and fisheries provides the livelihood for 85% of the people

- ✓ food security
- ✓ employment and income
- ✓ Foreign exchange earnings

❑ GDP from agriculture is about 37% (declining due to many reasons including non-renewable sector)

❑ Food production systems vary

- ✓ Semi-subsistence mixed-cropping with moderate inputs and family labour
- ✓ Large farms >1ha use high inputs of machinery, labour, chemicals

❑ Major crops and commodities:

- ✓ Food – taro, **sweet potato**, banana, cassava, breadfruit
- ✓ Cash – coconut, coffee, cacao, oil palm
- ✓ Alternative – spices, nuts, fruits, vegies



National Agricultural Research Institute (NARI)

Semi-autonomous and statutory research organization established by an Act of PNG National Parliament in May 1996



Vision: Prosperous PNG Agricultural Communities

Mandate

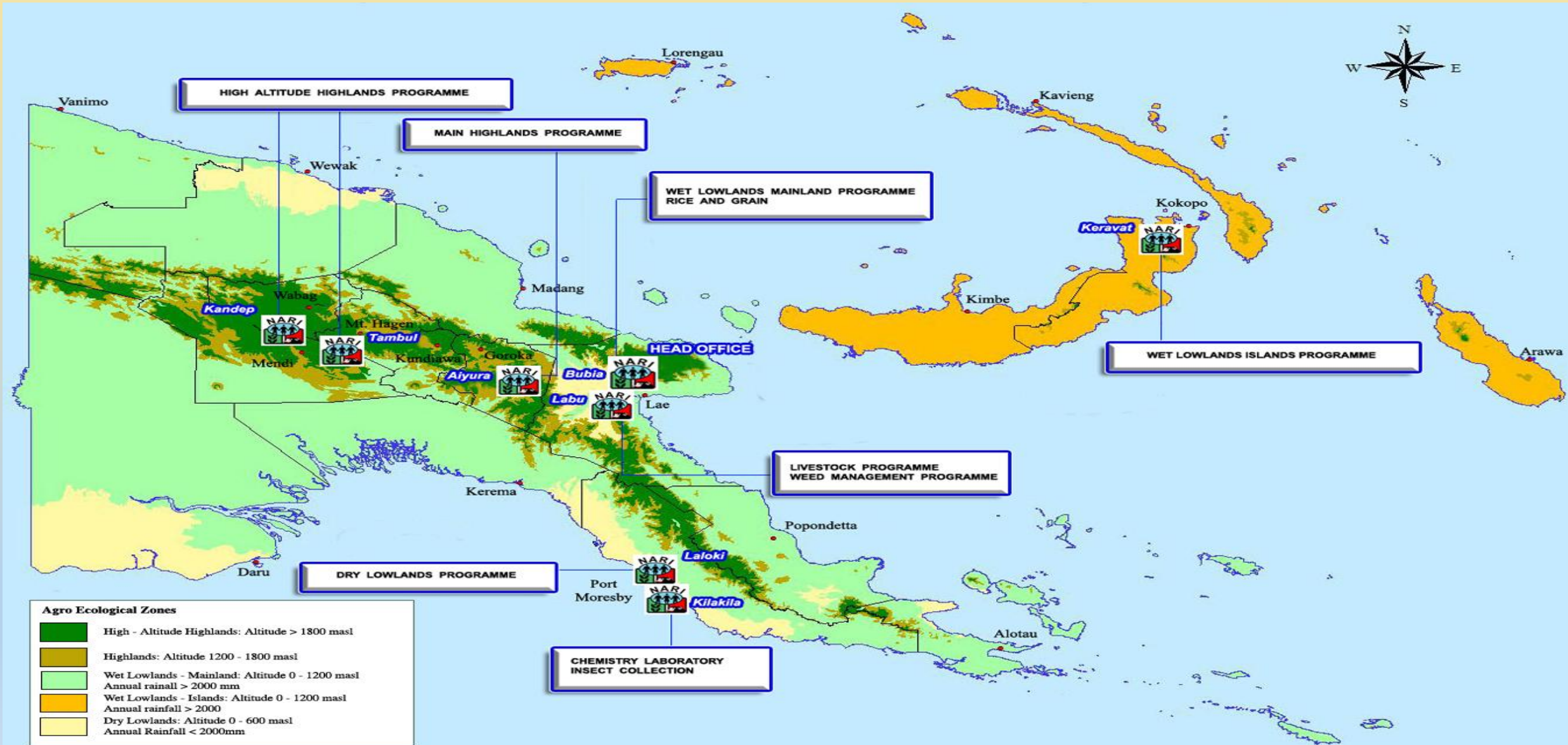
- ☐ Conduct applied and adaptive research on food crops, alternative food and cash crops, animal genetic resources and natural resource management issues
- ☐ Provide technical, analytical and diagnostic services to the agriculture sector (e.g. GIS, food analysis etc)
- ☐ Disseminate information, provide training, assists industry, stakeholders and the general farming community

Mission:

to promote innovative agricultural development in PNG through:

- ✓ scientific research
- ✓ knowledge creation
- ✓ information exchange

NARI Locations of Research and Technical Programmes



The Sweet Potato



The importance of sweet potato

- ❑ Largest genetic diversity of >5000 cultivars
- ❑ Number one and dominant staple food in PNG
- ❑ Annual production in 2007 @ 520,000 MT ([FAO, 2010](#))
- ❑ Contributes >60% of the energy needs ([Bourke, 2006](#));
~2kg/person/week
- ❑ Alternative cash crop – increasing volumes traded in markets
- ❑ 30% loss during transportation to markets ([Spriggs, 2006](#))

Handling and Transportation Practices

Characteristics:

- ✓ no good packaging
- ✓ stacked produce damage
- ✓ open air transport
- ✓ Non-refrigerated containers
- ✓ poor road conditions

Common for both
short and long
distance markets



Packaging and Storage Practices (ASEM/2006/035)

Packaging methods:

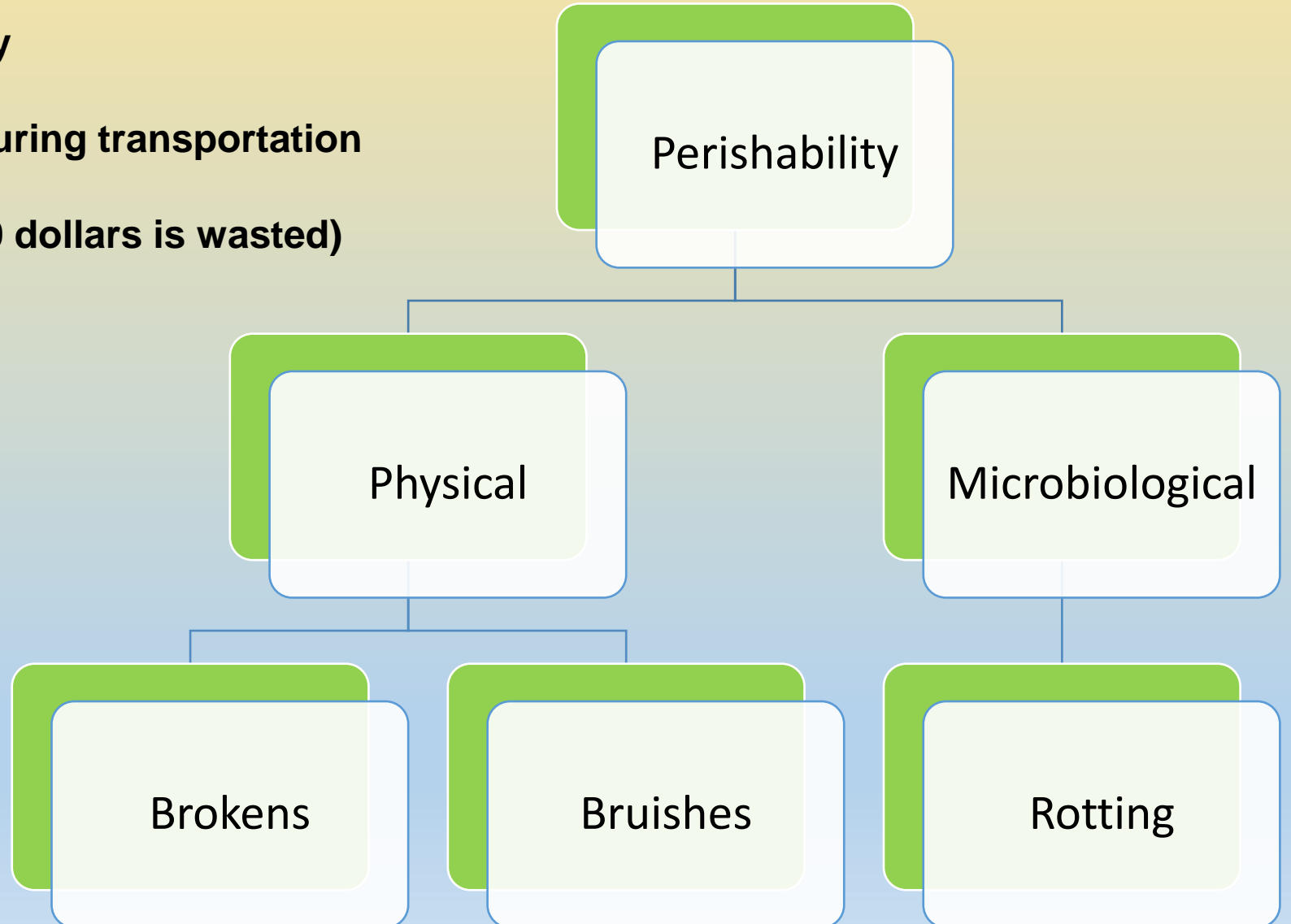
- ✓ Polypropylene bags
- ✓ Bilum (string bags)
- ✓ Cardboard boxes
- ✓ Crates



Grading by size and/or degree of damage is done for supermarkets and contract supplies

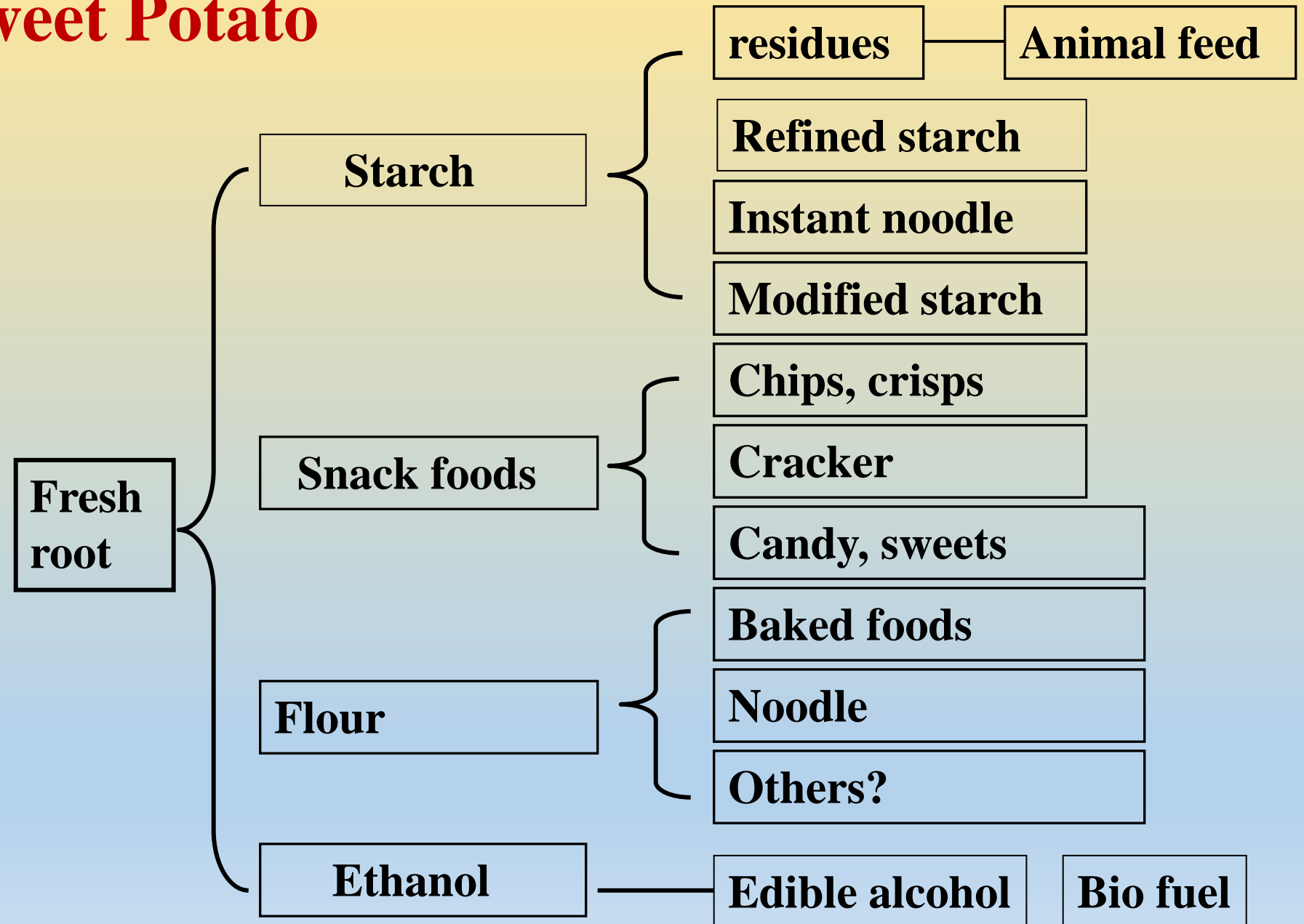
Shelf-life of Fresh Crop

- ❑ High in moisture (~70%) and bulky
- ❑ ~30% of the fresh roots are lost during transportation
- ❑ In dollar terms (\$30 for every \$100 dollars is wasted)



Processing of Sweet Potato

- ❑ Cooking in water or coconut cream with meat and vegetables
- ❑ Roasting over fire
- ❑ Earth-oven cooking in hot stones in dug-up holes in the ground (mumu)



Current Efforts to Address Postharvest Losses and Processing of Sweet Potato in PNG

Key Questions to Guide

- Where in the supply chain are the losses occurring?
- What are the factors responsible?
- How can we quantify the losses?
- How can we address these issues?

1. Consignment Tracking by Road



- ❑ Characteristics:
 - ✓ Road transport (Goroka to Lae)
 - ✓ Cooler climate to hot condition
 - ✓ Distance of 2855 km, 4-5 hrs drive
- ❑ Monitoring using data loggers for of:
 - ✓ Temperature
 - ✓ Humidity

2. Consignment Tracking by Sea

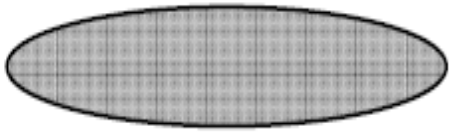


□ Journey from Lae to Port Moresby:

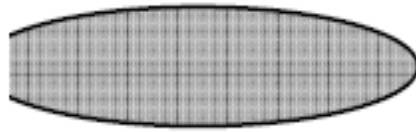
- ✓ Mainly on cut-out dry containers
- ✓ Takes 3-4 days to arrive (581nm)
- ✓ Expensive to fly for only 45mins

3. Assessment of Roots in Markets (ASEM/2006/035)

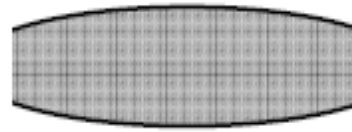
Roots were scored using a 0 to 5 scale (where 0=none and 5=severe):



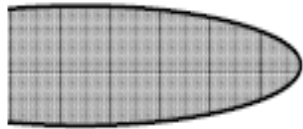
0 = no breaks



1 = one small
break



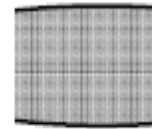
2 = two small
breaks



3 = one large
break



4 = one large break
and one small break



5 = two large
breaks

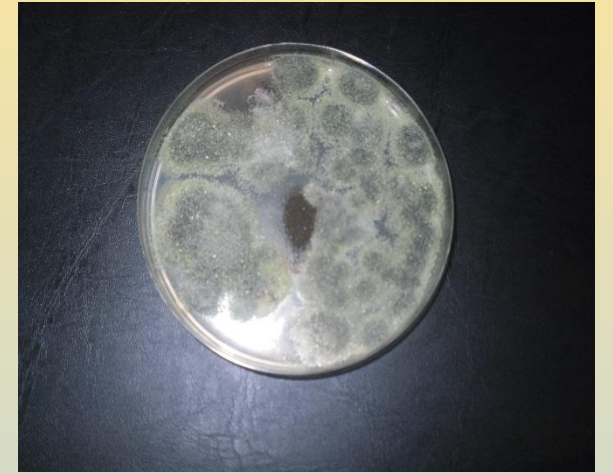
- ❑ To quantify the losses
 - ✓ marketable
 - ✓ wastage

- ❑ Developed scoring system to assess:
 - ✓ Broken roots
 - ✓ Skinning
 - ✓ Cuts & abrasions
 - ✓ Rotting

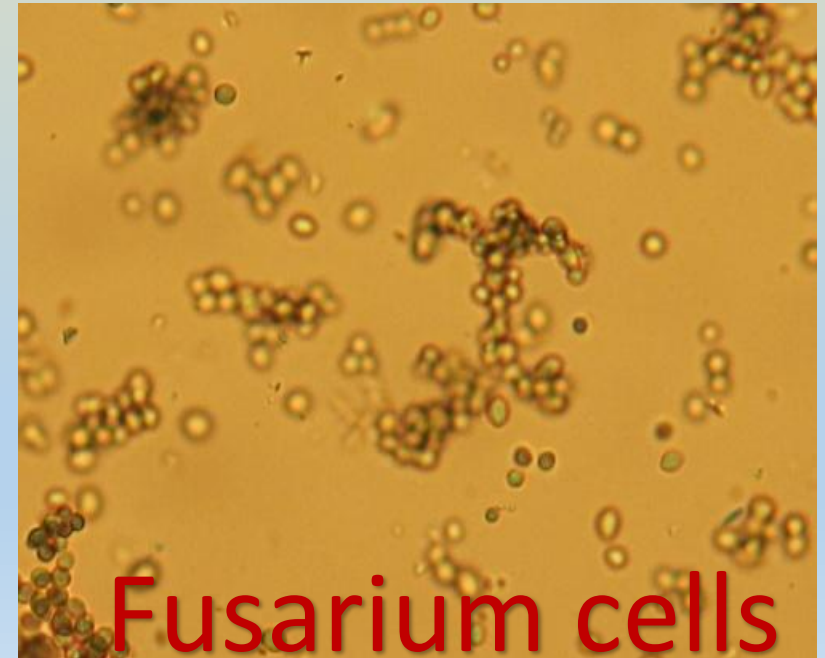
4. Disease Identification (ASEM/2006/035)



- ❑ Major diseases and organisms
 - ✓ Fusarium
 - ✓ Rhizopus
 - ✓ Penicilium
 - ✓ Black rots (could not really identify)



Fusarium rot



Fusarium cells

5. Improving Marketing Systems (ASEM/2006/035)

- ❑ Farmer direct to markets (local)
- ❑ Long distance markets
 - ✓ Farmer + wholesaler + markets
 - ✓ Farmer + wholesaler + buyer + seller
 - ✓ Farmer to contractor (mine, supermarkets)

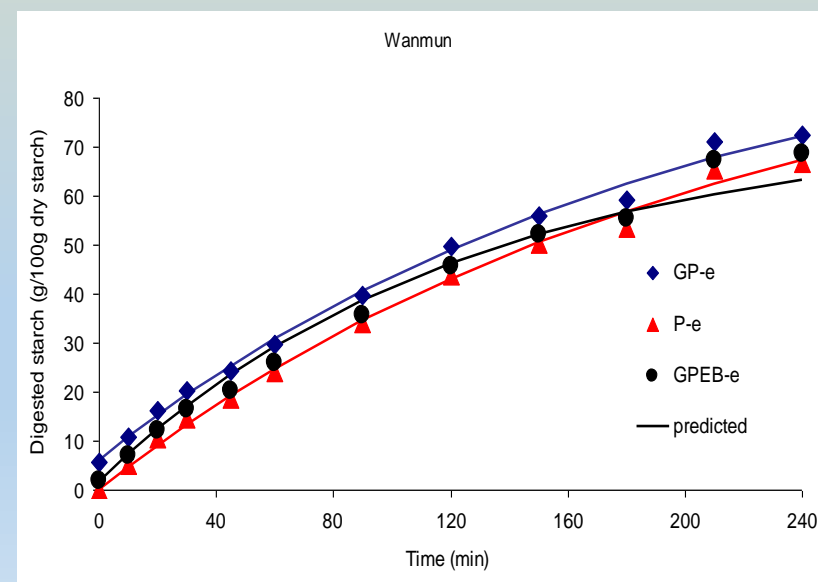
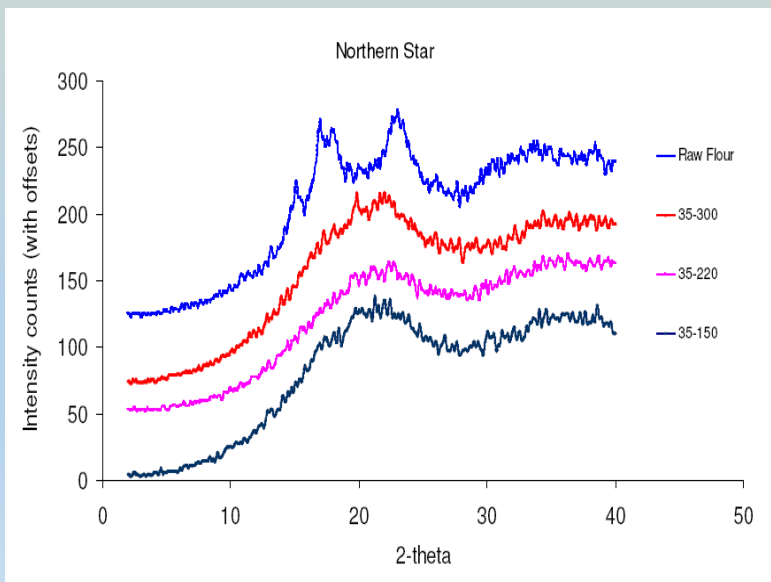
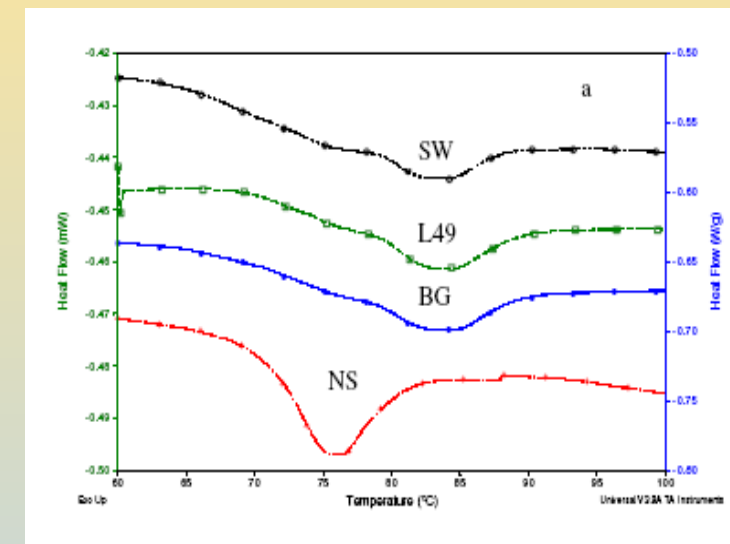
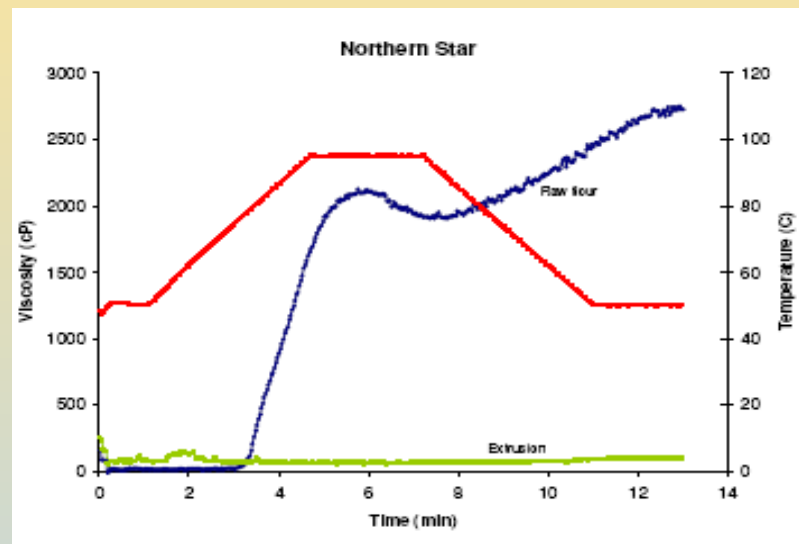
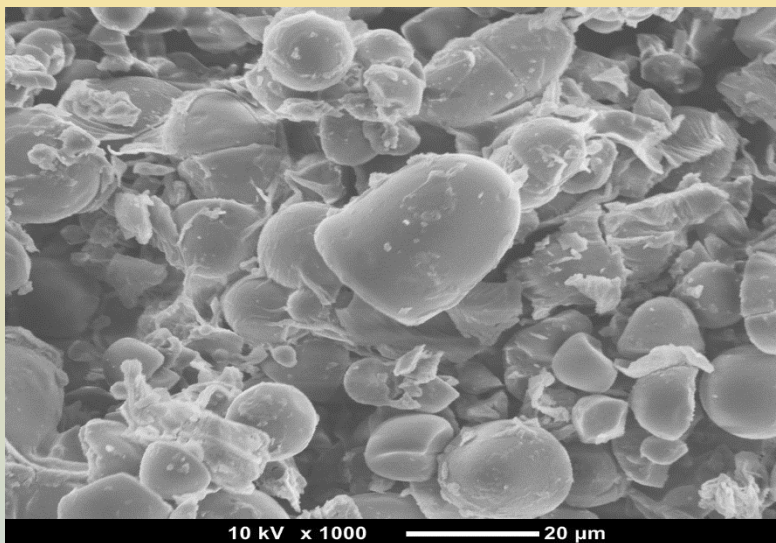


NEED TO HAVE PROPER ORGANIZED MARKETING SYSTEM IN PLACE

Sweet Potato Processing

- ❑ Studies on food properties of sweet potato
- ❑ Understanding these properties will guide:
 - ✓ Selection of suitable varieties for different end-uses and/or products

Flour and starch properties of sweet potato (Waramboi et al., 2011, 2012, 2013)

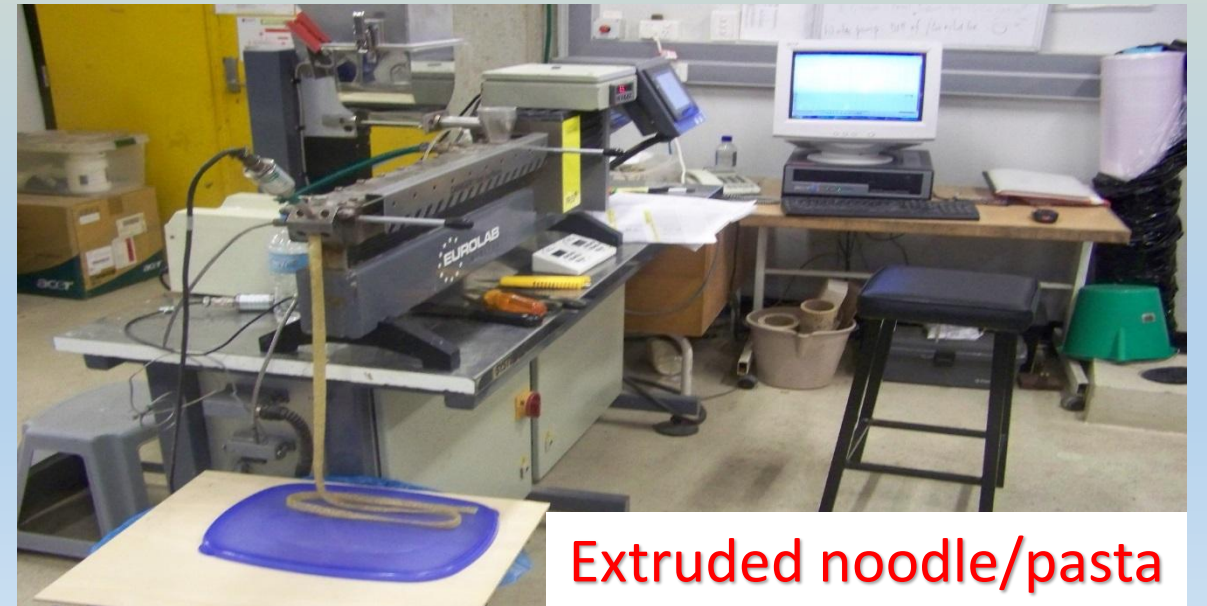
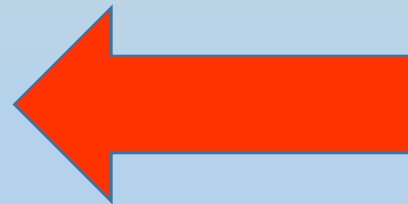
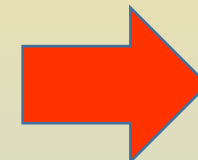
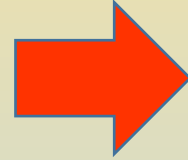


Sweet potato processing

- ❑ Processing into forms such as:
 - ✓ Flours
 - ✓ Flour based formulations – crackers
 - ✓ Chips/crisps/fries
 - ✓ Whole/cuts in preservatives
 - ✓ Osmotic dehydrated pieces



Extrusion processing of sweet potato flours



Needs and Priorities for Postharvest and Processing of Sweet Potato in PNG

Priority Area 1.

Improving current practices and supply chain of the fresh crop

- (a). Develop/promote simple and low cost materials for packing, handling and extending shelf-life of the crop
- (b). Organized market systems – e.g. farmers groups/associations to improve marketing efficiency and reduce postharvest handling and losses
- (c). Encourage use cool-chain systems for produce handling especially for distance markets

Priority Area 2.

Improving and Up-scaling of Cottage Food Processing to Small and Medium Scale Enterprises

(a). Establish protocols for processing various sweet potato products to meet food safety and industry standards

- Characterization of food properties
- Sensory and consumer preferences

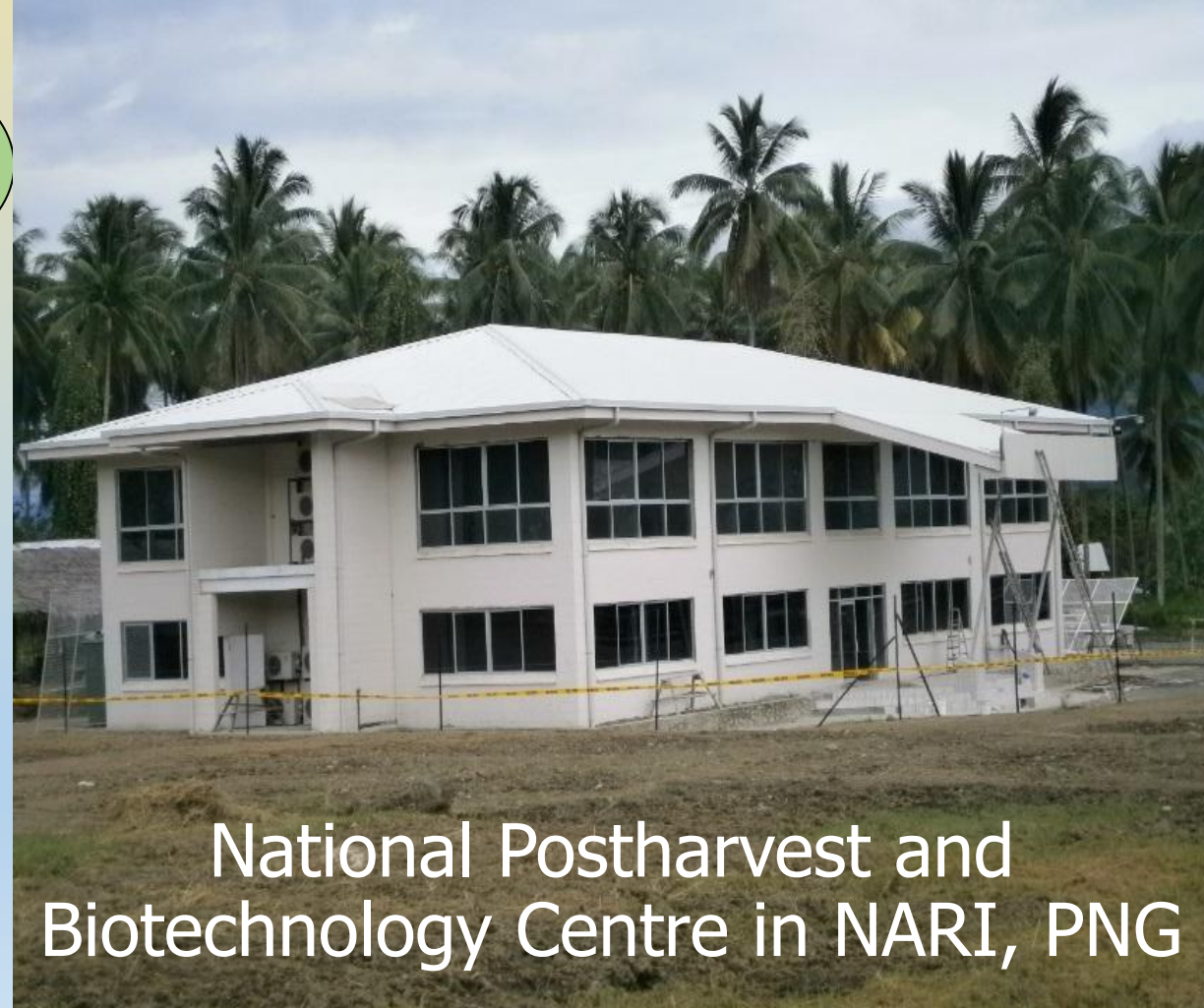
(b). Up-scale and promote existing cottage processing activities such as flour, chips/crisps etc from sweet potato

On the way forward with sweet potato....

- ❑ Scientific interventions
 - ✓ Characterizing and understanding the food properties of the flours and starches to guide maximum utilization.
 - ✓ Select suitable varieties for different end use qualities
- ❑ Training and information dissemination
 - ✓ Farmer trainings, especially women groups
- ❑ Partnership with industry to commercialize
 - ✓ Cracker biscuits by Paradise Foods Pty Ltd

Some
considerable
efforts have
already been
made **BUT MORE
STILL REMAINS TO
BE DONE**

Thank You



National Postharvest and
Biotechnology Centre in NARI, PNG