

# **Agriculture in PNG: Conditions, Future Prospects and Dispelling Some Myths**

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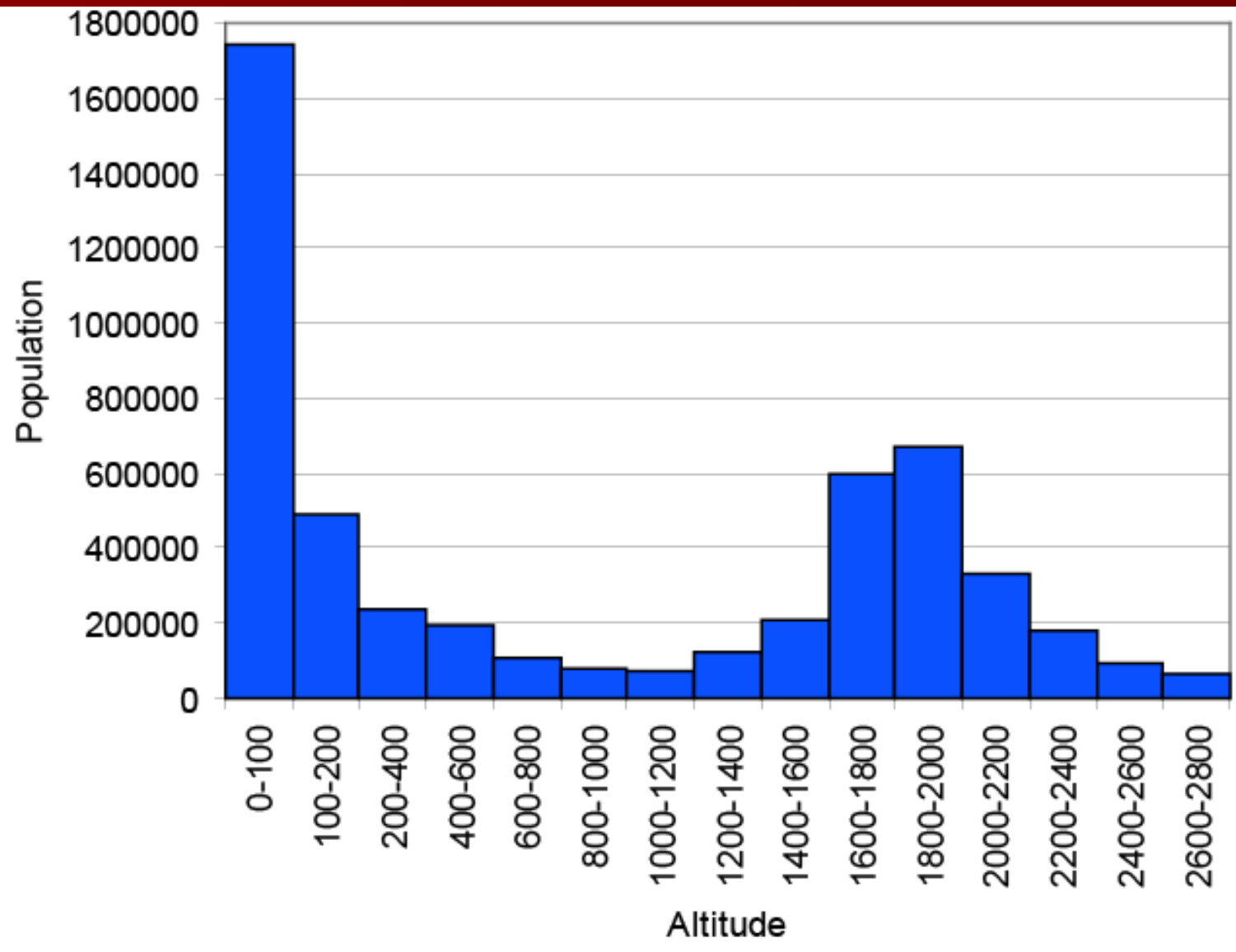
# Introduction

- This talk is based on a recently completed book:  
*Food and Agriculture in Papua New Guinea*. R.M. Bourke and T. Harwood (eds). ANU, Canberra.
- Topics covered in the talk include:
- An overview of agriculture in PNG now (food production, food consumption and cash cropping)
- The role of smallholders and what influences their decision making
- Impact of global climate change on PNG agriculture
- Future prospects for PNG agriculture
- Dispelling some myths about PNG agriculture

# Demographic background

- The estimated mid-2008 population was 6.5 million
- This consisted of:
  - 81% rural villagers (5.3 million people)
  - 13% urban (0.8 million people)
  - 6% rural non-village (0.4 million people)
- Population growth rate is 2.7% pa (1980-2000)

# Population distribution by altitude



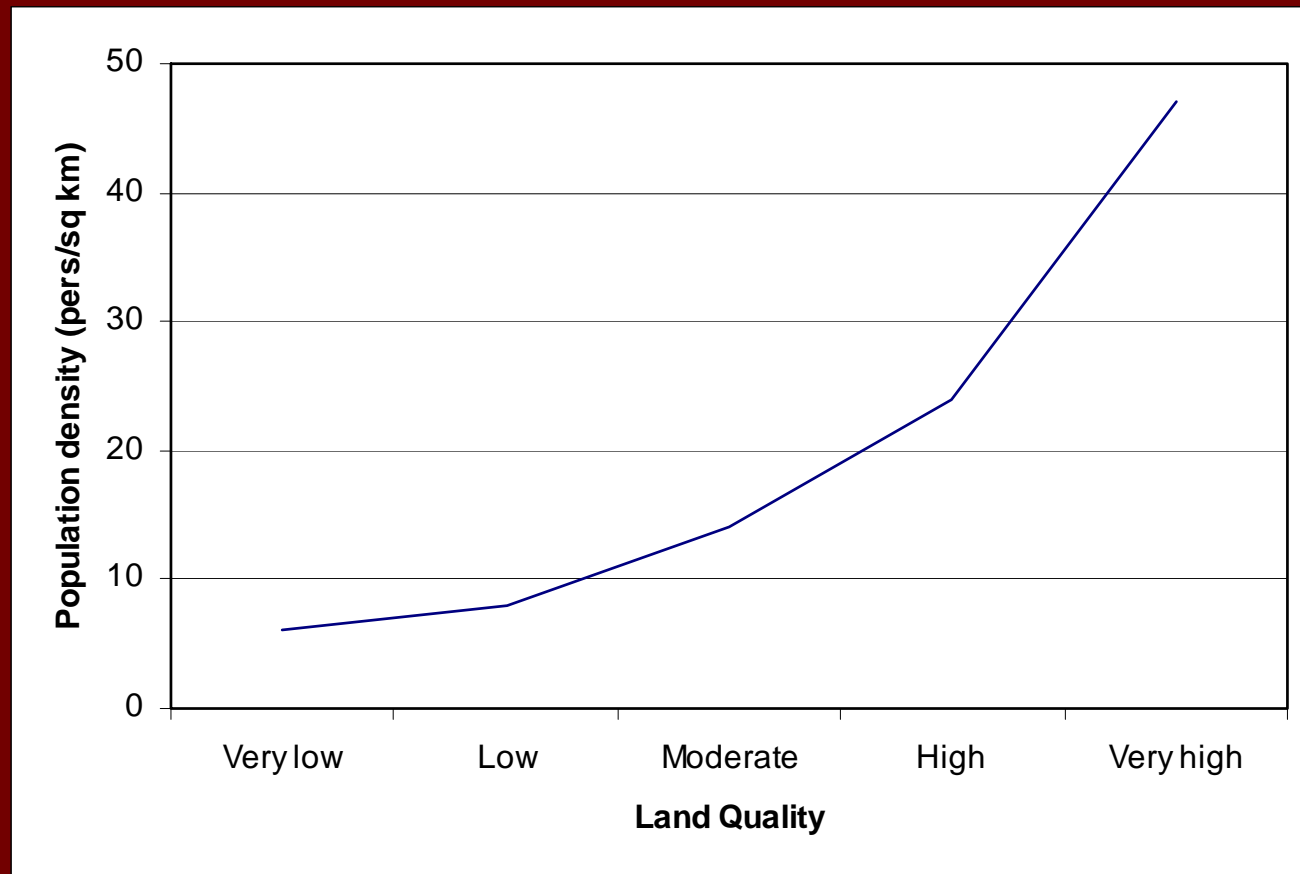
# Rural villagers

- Based on cash income and other measures, rural villagers may be further sub-divided into:
- Not poor - 39% (2.1 million in mid-2008)
- Marginally poor 42% (2.2 million in mid-2008)
- Extremely poor 18% (1.0 million in mid-2008)
- It is people in the first group and some in the second group who produce most of the cash crops and have the highest consumption rate for imported goods.

# Land use in PNG

- In 1975, only 26% of PNG's mass was used for agriculture (fallow, food gardens, tree crops)
- This figure has grown to about 30% now
- The remaining 70% has never been used for agriculture
- This is because it is too swampy, too steep, rainfall and cloud cover are excessive, or it is too high (above 2800 m altitude)
- Even within the 30% that can be used for agriculture, there are often severe limitations.
- Only 7% of the total land area is classed as high or very high quality and a further 20% is of moderate quality for growing crops
- For example, the most common soil type in Western Province is a Ultisol, which are infertile and have limited potential for agricultural production
- There is a close association between population density and productivity, with the highest population density in the best agricultural environments.

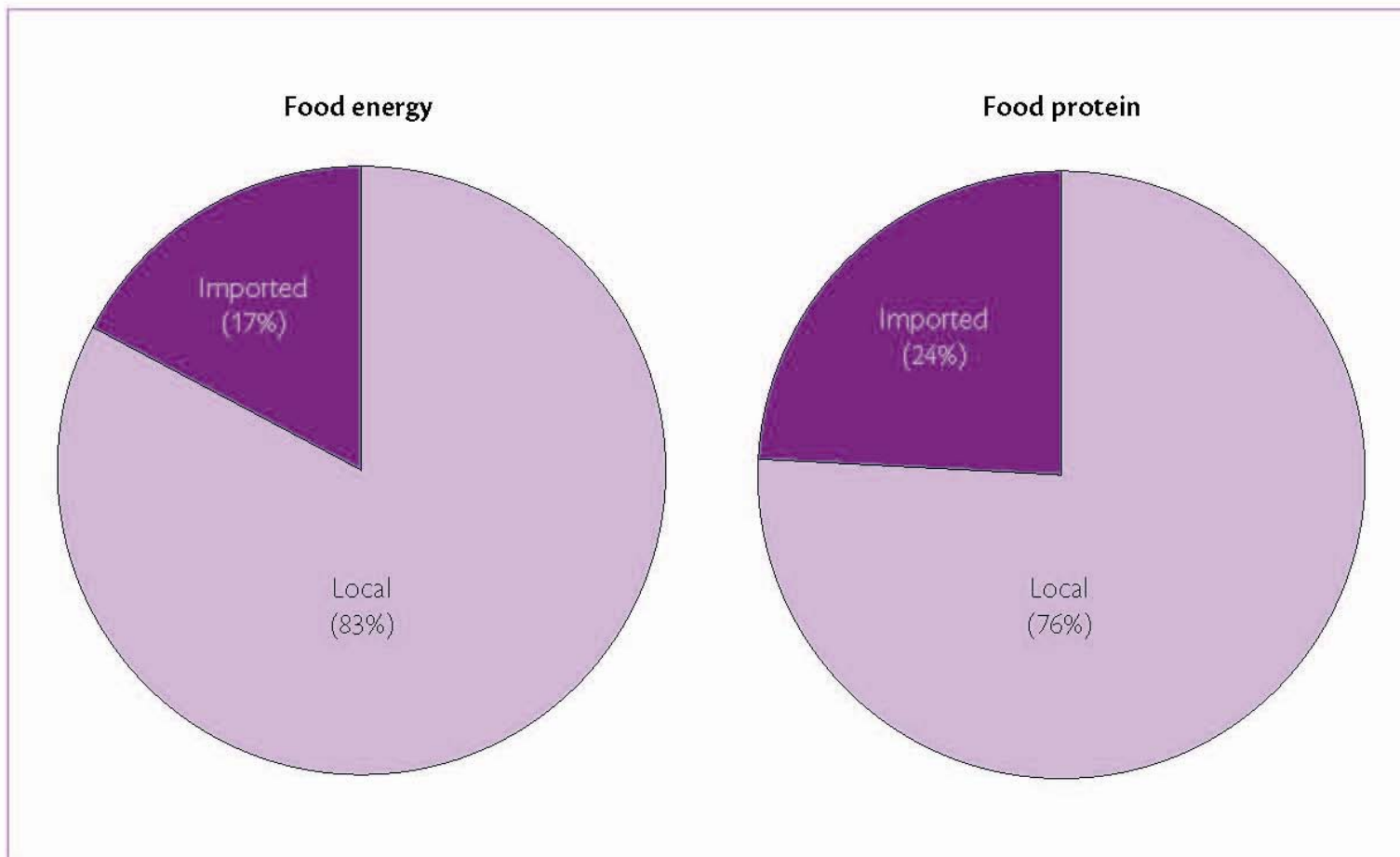
# Association between land quality and population density



# Food production and consumption

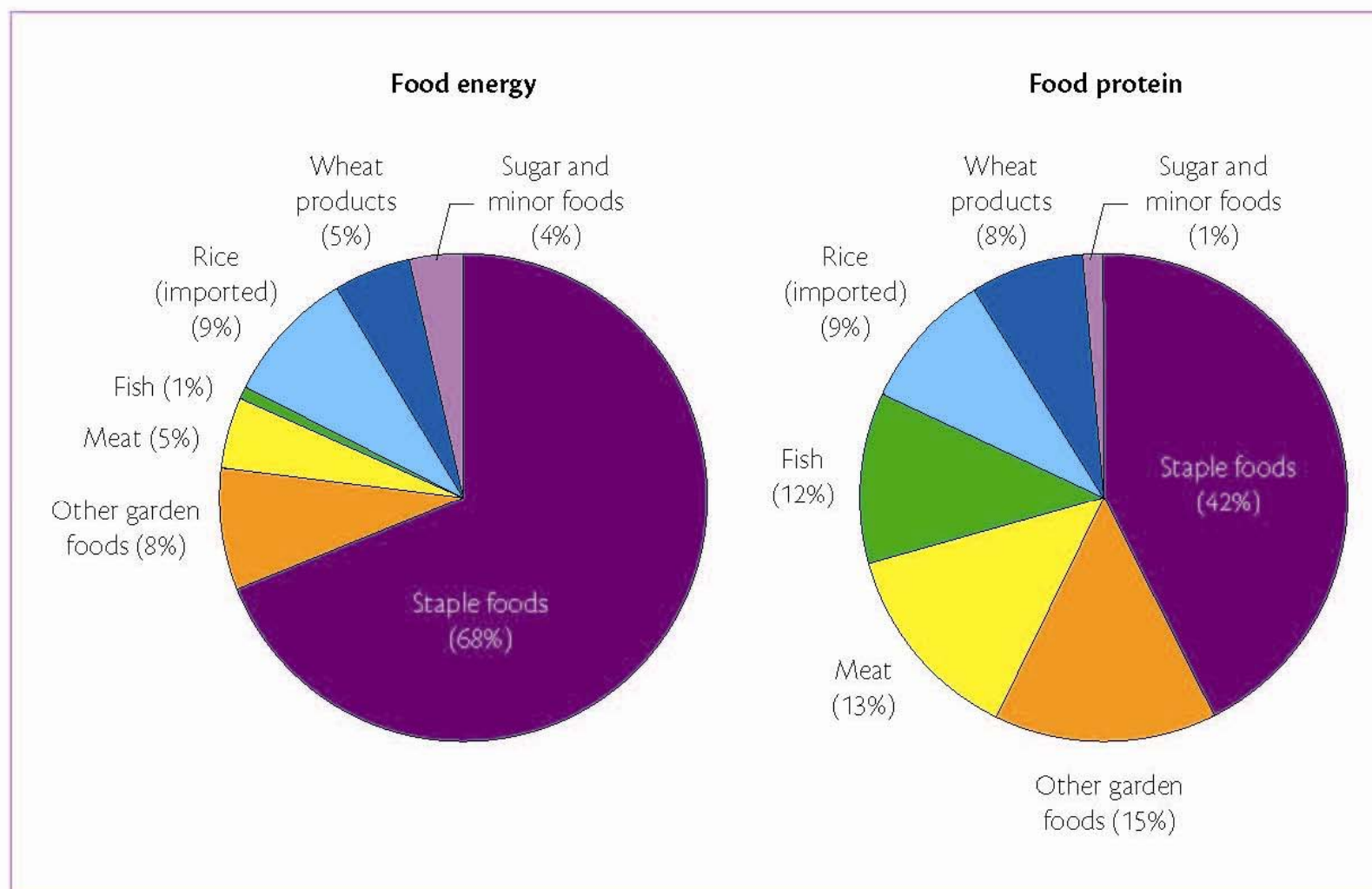
- 83% of food energy consumed in PNG is locally produced (cf 80% in 1996)
- 76% of food protein in PNG is locally produced
- Imported rice and wheat-based foods provide less than 15% of food energy
- Subsistence food production is keeping pace with population growth
- Consumption of imported food (rice, wheat-based foods, meat, fish, fresh food) **per person** has been static or has declined over the past 15 years (since 1994)





**Figure 2.1.1** Proportion of energy and protein derived from locally produced and imported foods, 2006.

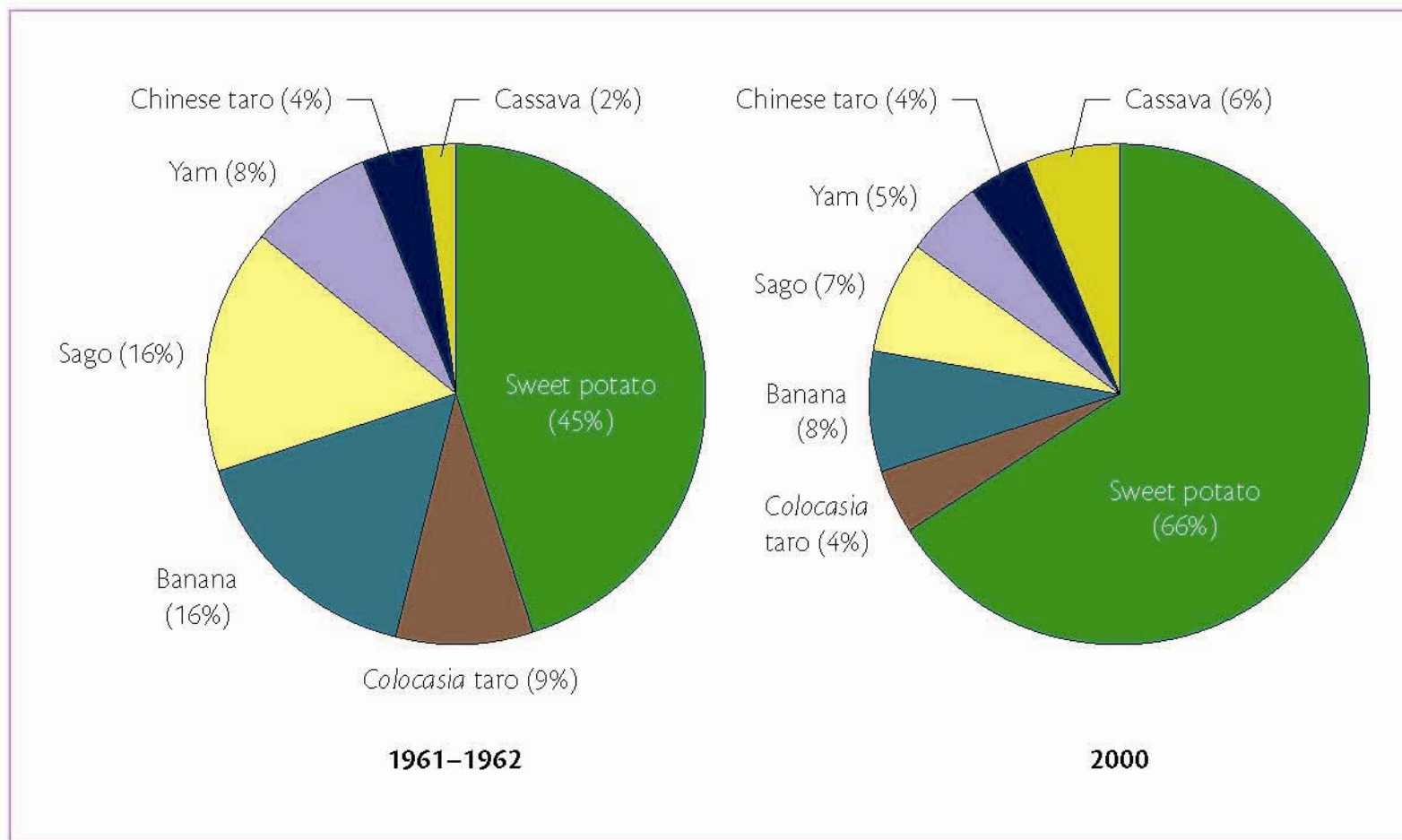
Source: Table A2.1.1 and author's calculations.



**Figure 2.1.2** Source of energy and protein by main food groups, 2006. Source: Table A2.1.1 and author's calculations.

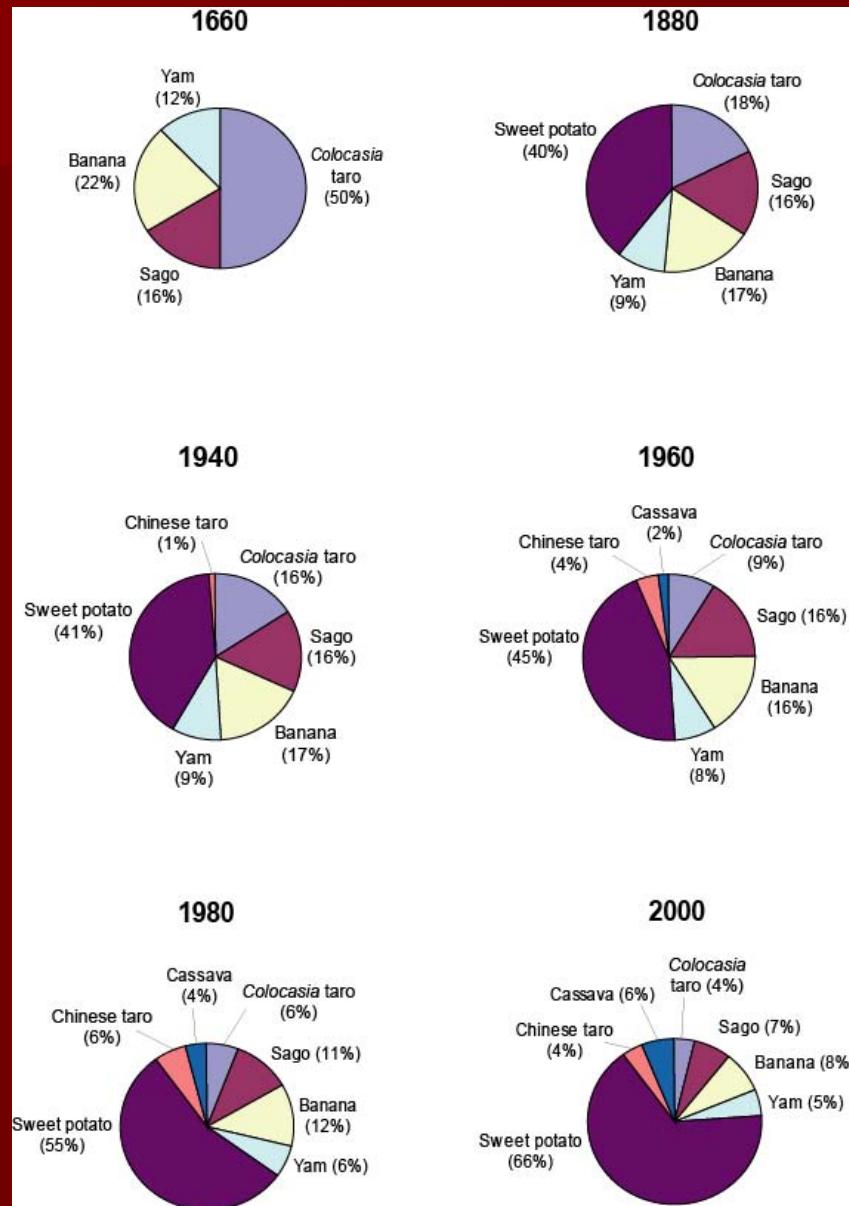
# Locally grown foods

- Sweet potato is the most important locally grown food
- Production of sweet potato and cassava has increased greatly over the past 50 years
- Production of taro, sago, yam and banana has been fairly static over past 50 years, but has declined as a proportion of total food production and consumption



**Figure 2.2.2** Estimated production of food energy of staple food crops: Survey of Indigenous Agriculture, 1961-1962 and Mapping Agricultural Systems of PNG Project, 2000. **Note:** Rice was estimated as 0.4% of food energy of the staple food crops in 1961-62, and as 0.03% in 2000. Sources: Walters (1963); Bourke and Vlassak (2004).

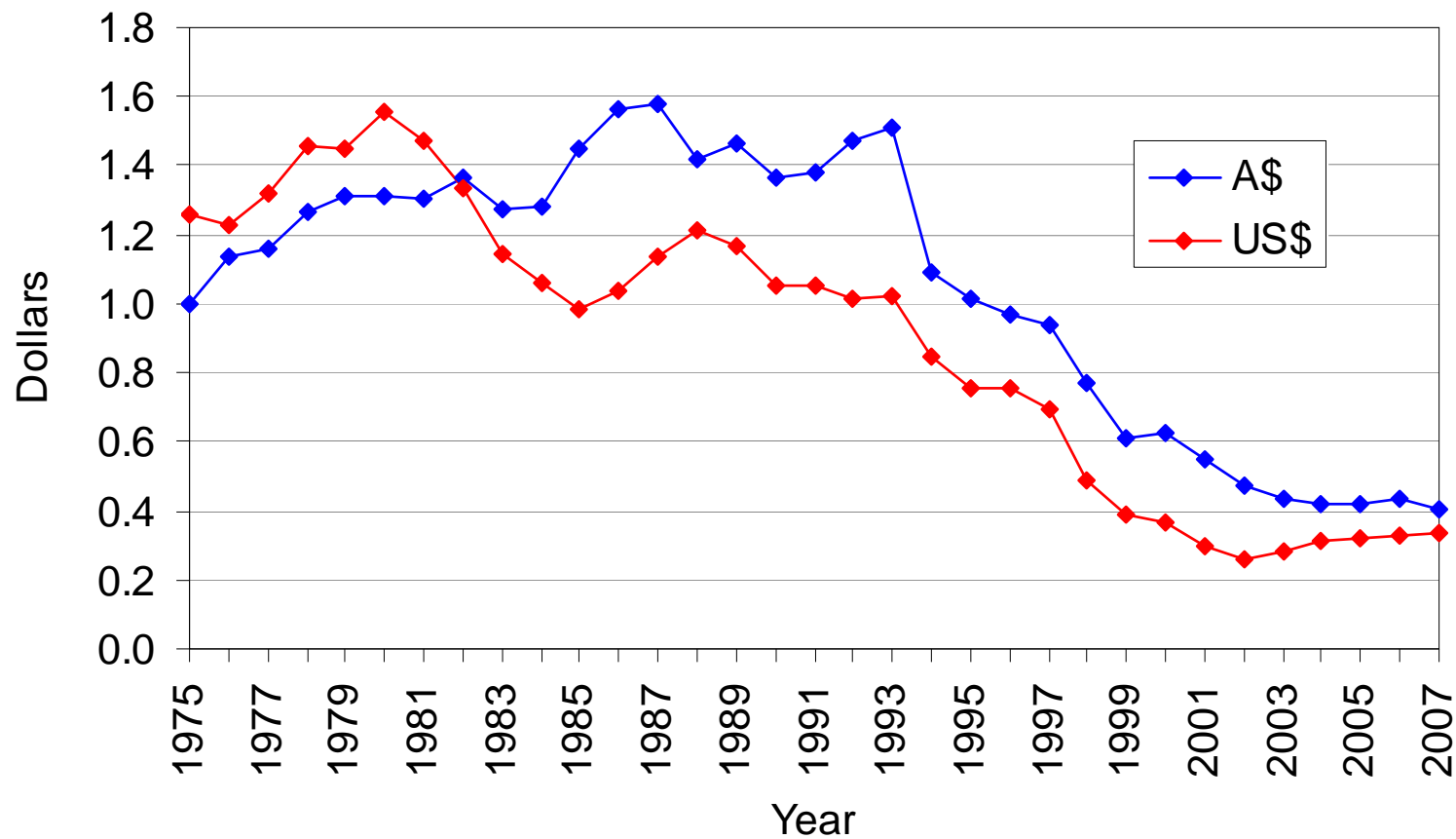
# Food staples from 1660-2000



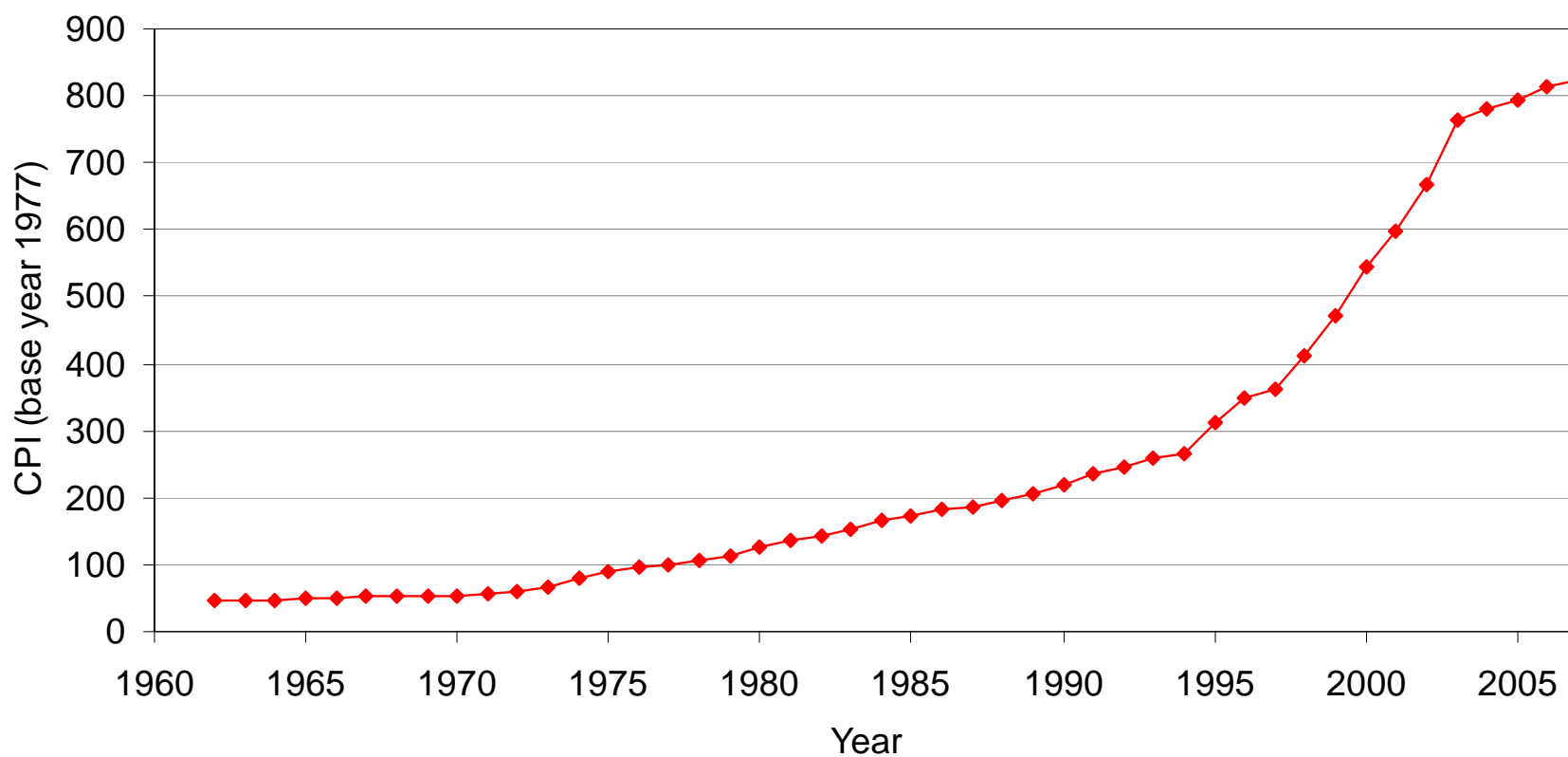
# Domestically marketed food

- Domestically marketed food has expanded greatly over the past 35 years, and particularly since 1998
- This is associated with the devaluation of the PNG currency vs US dollar
- This resulted in steep increases in the price of imported food
- Increased demand for locally grown food since 1998 coincided with poor returns to highland coffee producers
- Many highlanders responded by increasing production of sweet potato and other fresh foods for sale in local and lowland markets

# Exchange rate for one PNG kina against the Australian dollar and United States dollar, 1975–2007

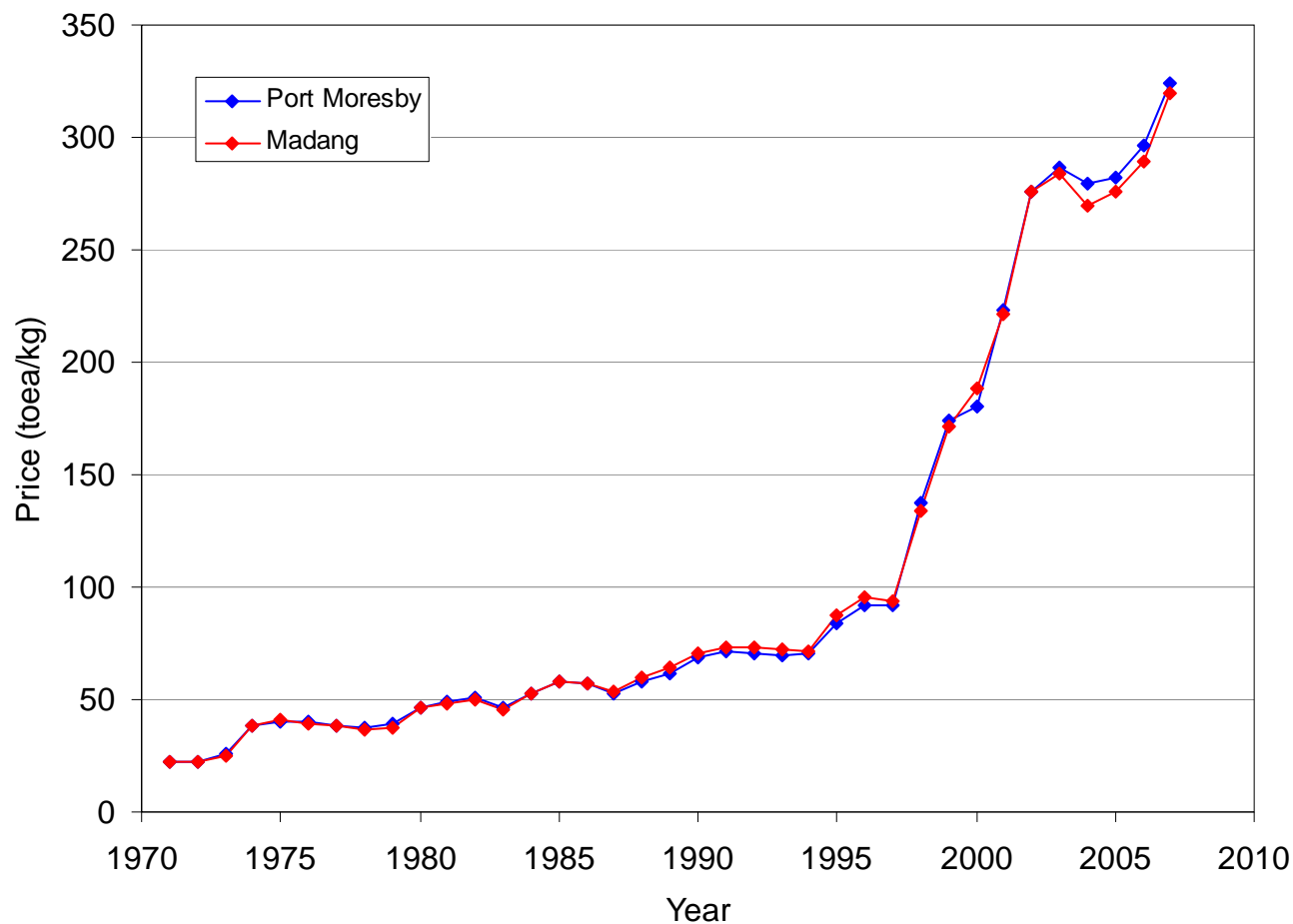


# PNG consumer price index, 1962–2007

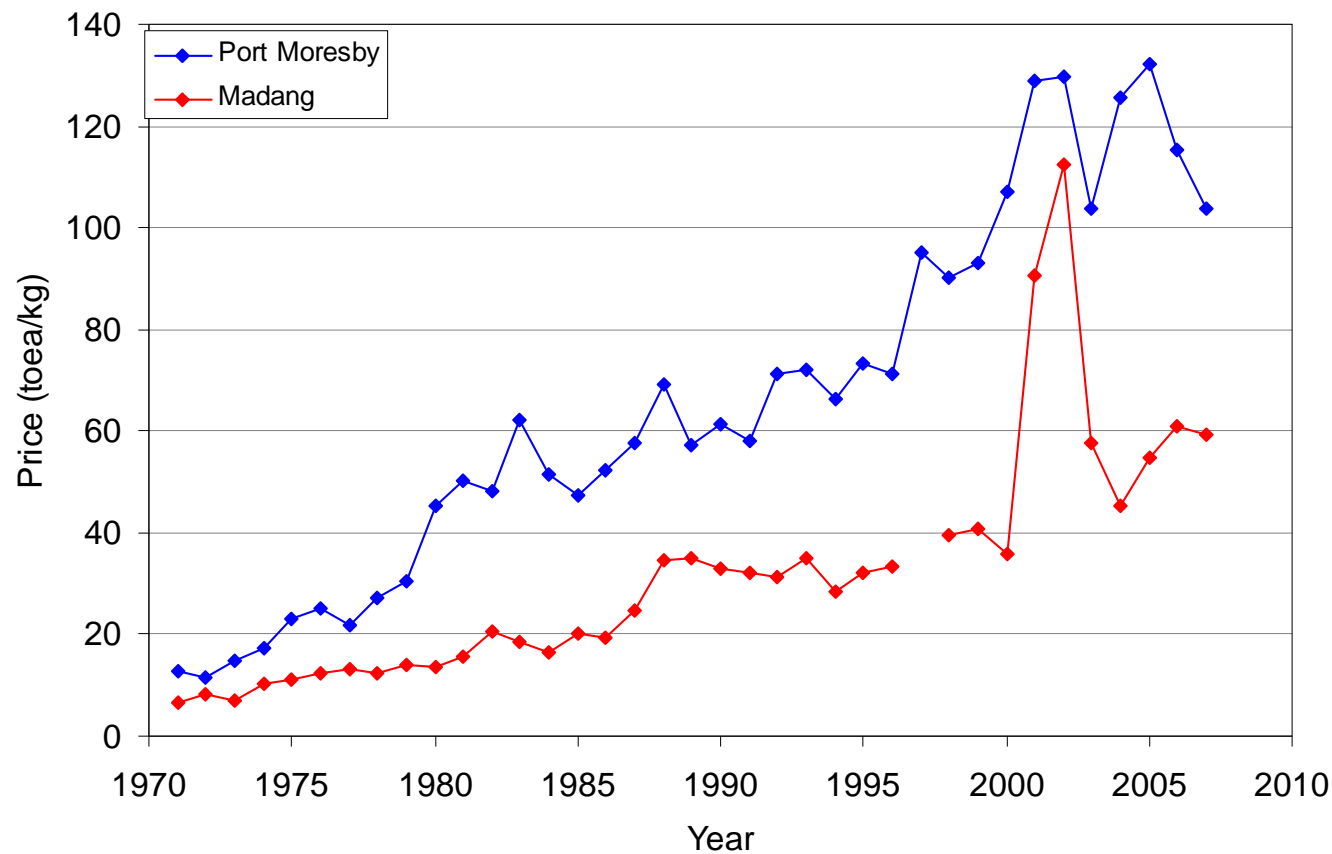




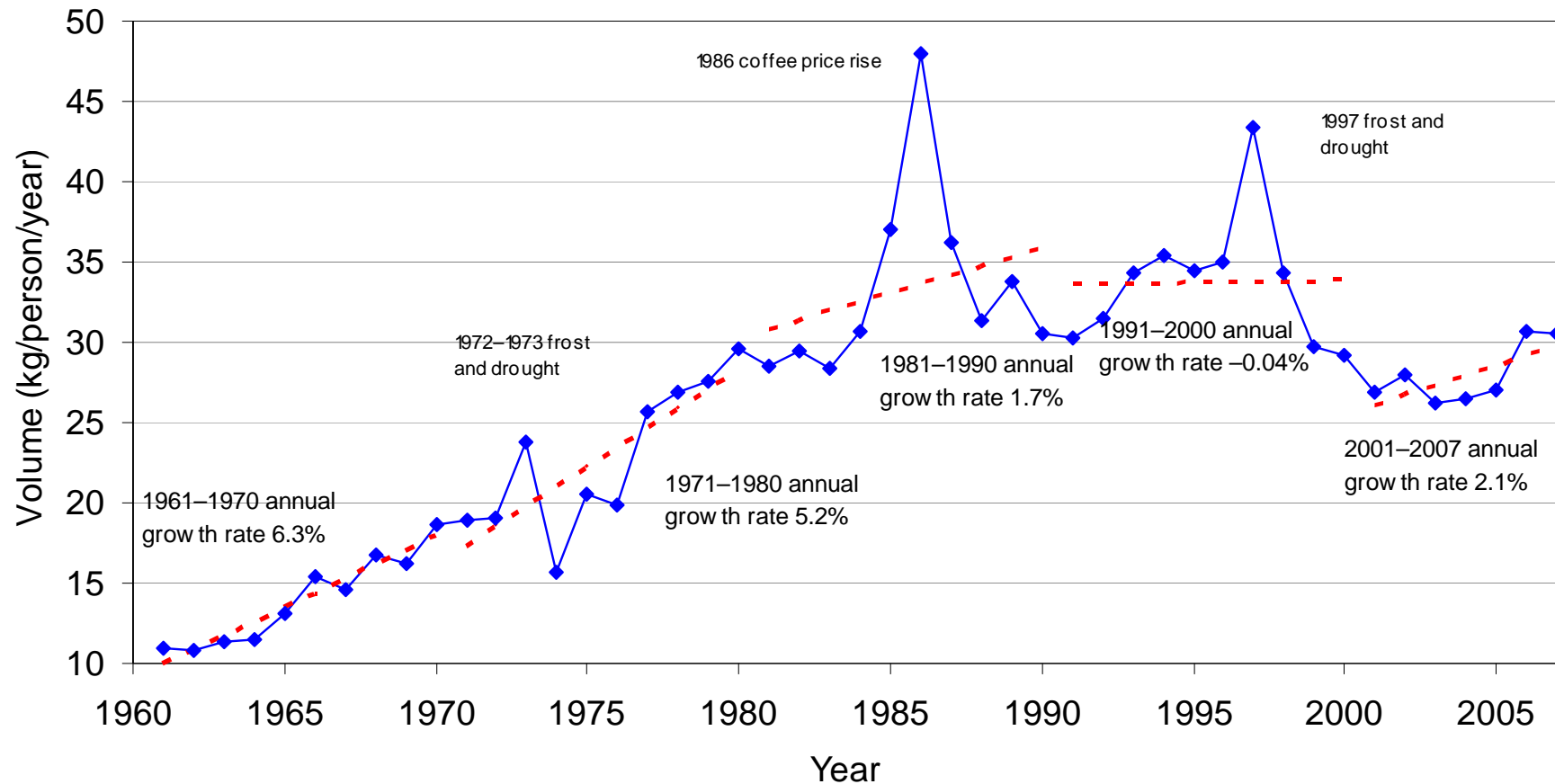
# Average retail price of rice in Port Moresby and Madang, 1971–2007



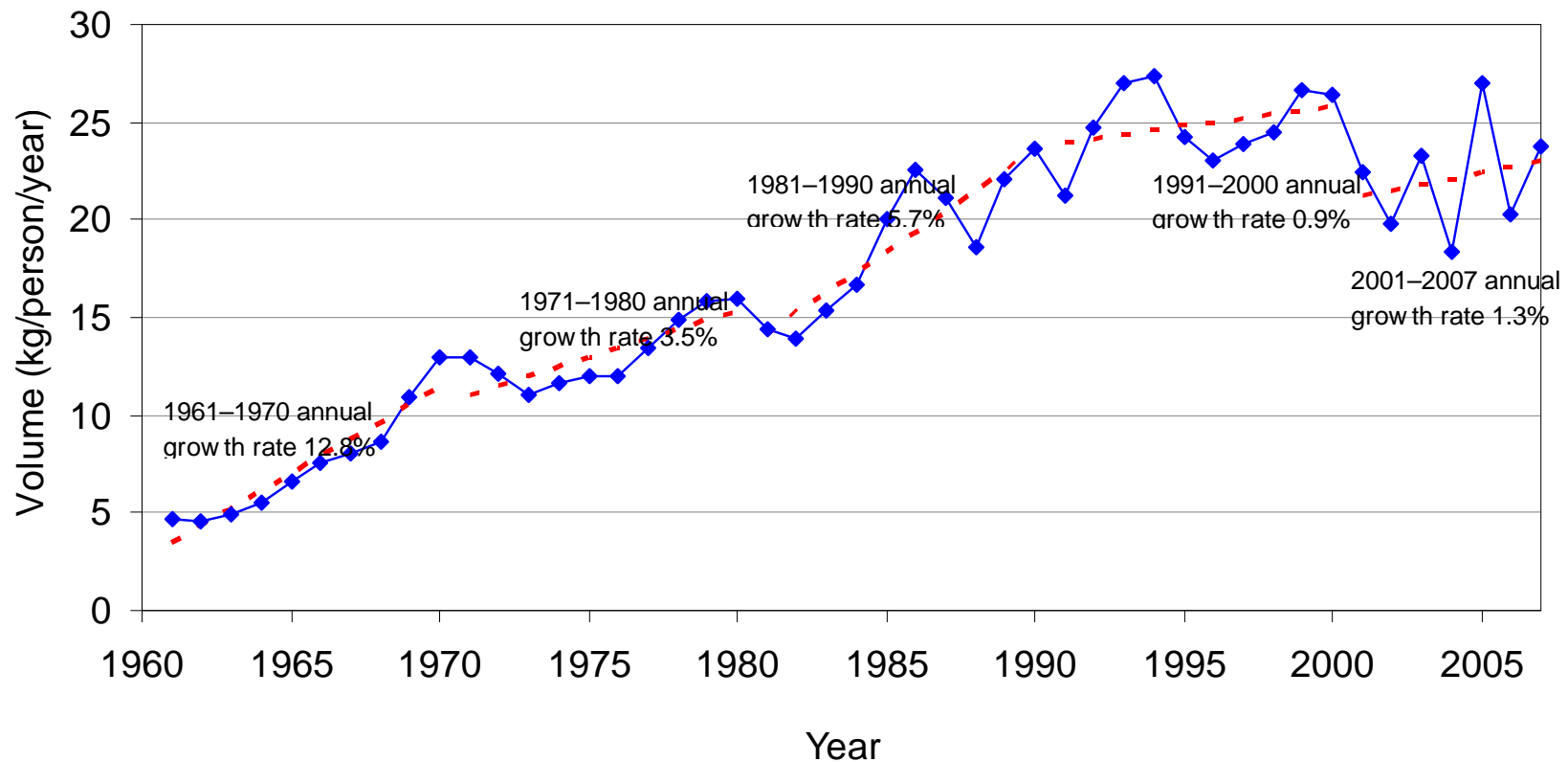
# Average market price of sweet potato in P. Moresby and Madang, 1971–2007



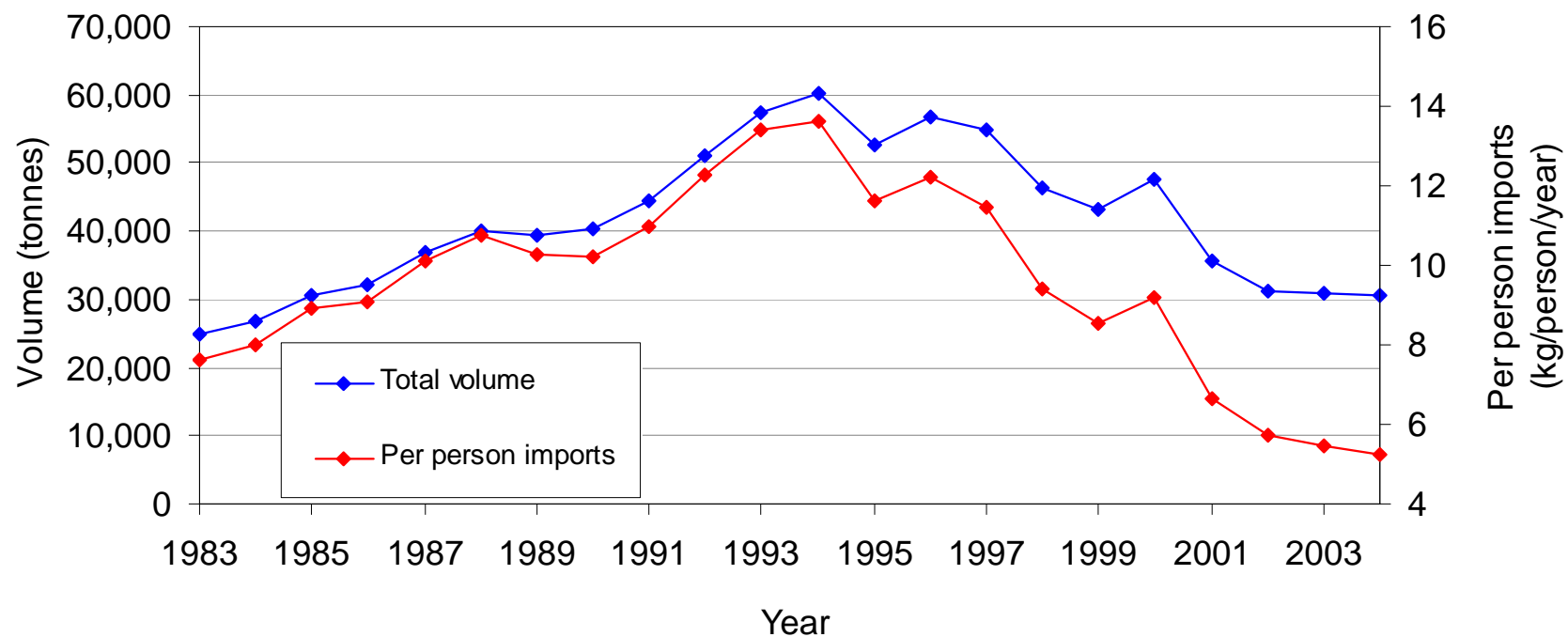
# Average per person rice imports into PNG and growth trends by decade, 1961–2007



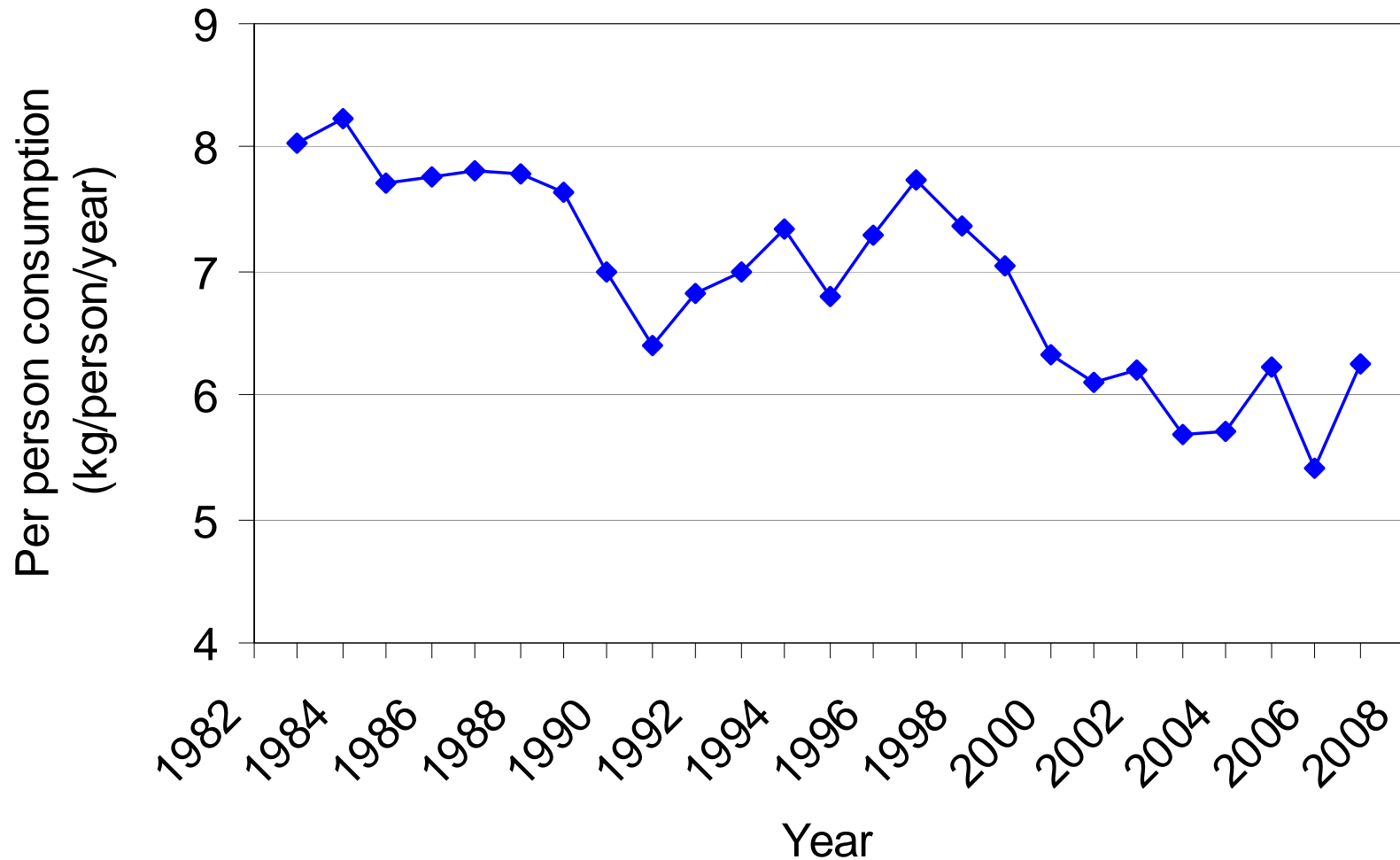
# Average per person wheat imports into PNG and growth trends by decade, 1961–2007



# Volume of meat imports into PNG from Australia and New Zealand, 1983–2004



# Annual consumption of sugar in PNG per person, 1983-2007

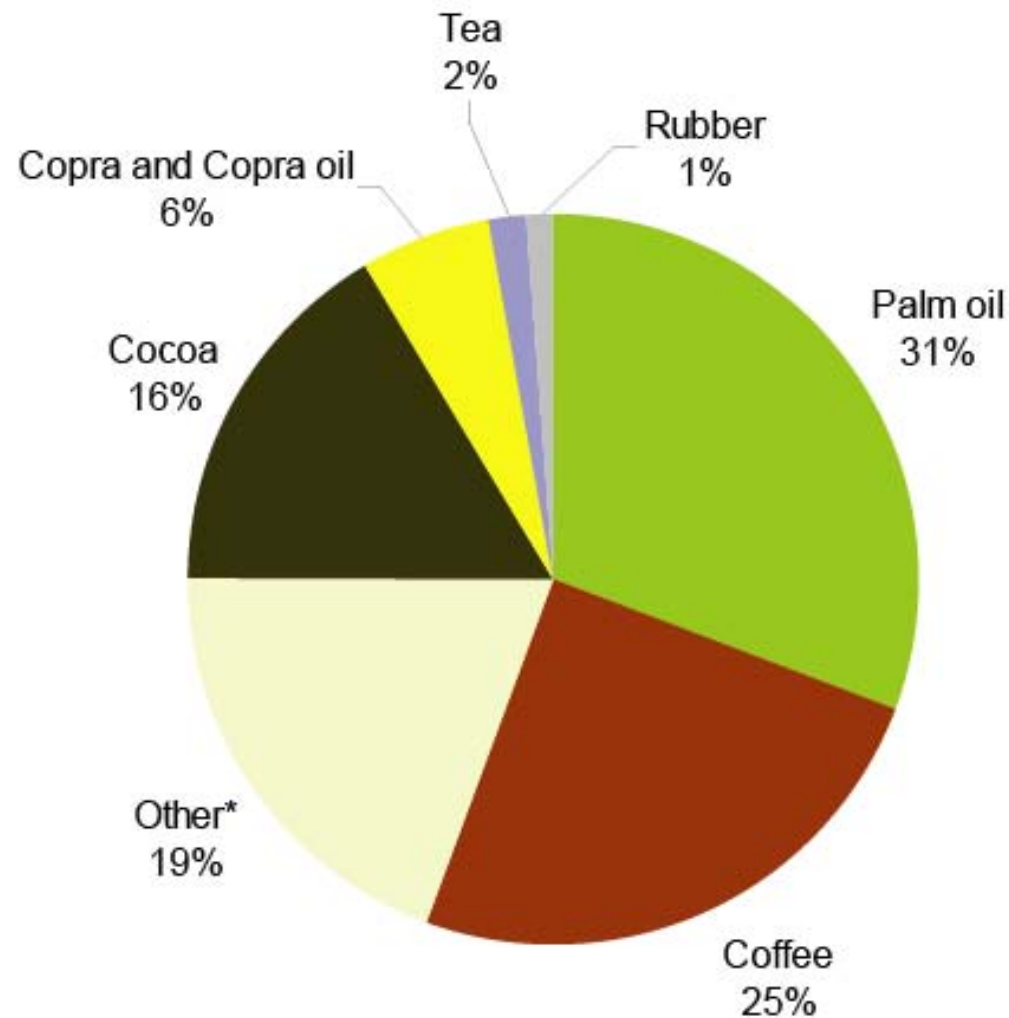


# Cash cropping

- The main sources of cash income for rural villagers are various agricultural enterprises
- These are (in order of total income for villagers):
- Arabica coffee, fresh food, cocoa, betel nut/pepper, copra, oil palm, firewood, fish/seafood, tobacco, cattle, vanilla, Robusta coffee, animal plumes and crocodiles
- Oil palm is now the most important agricultural export, but only 3-4% of rural villagers are involved in oil palm production
- Note that products in both the formal and informal sectors are important

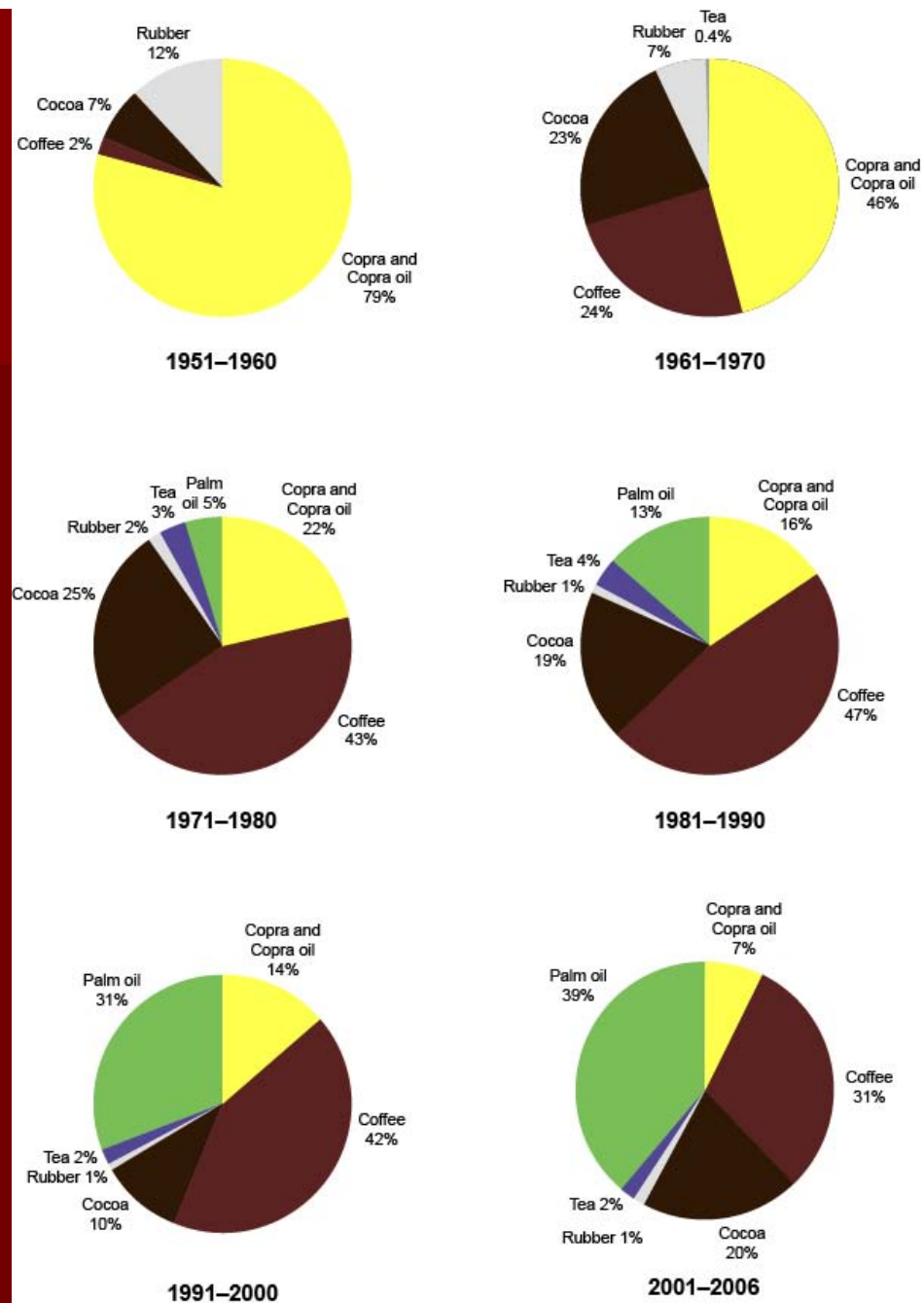


**Figure 5.2.2** Contribution by value of the main cash crops to agricultural exports, 2002–2006  
(annual mean)



\* 'Other' includes canned tuna, canned beef, processed tea and coffee, spices, and minor commodities such as artefacts, crocodile skins and butterflies. Vanilla was a major component (about one-third) of the 'other' category for the period 2002–2006.

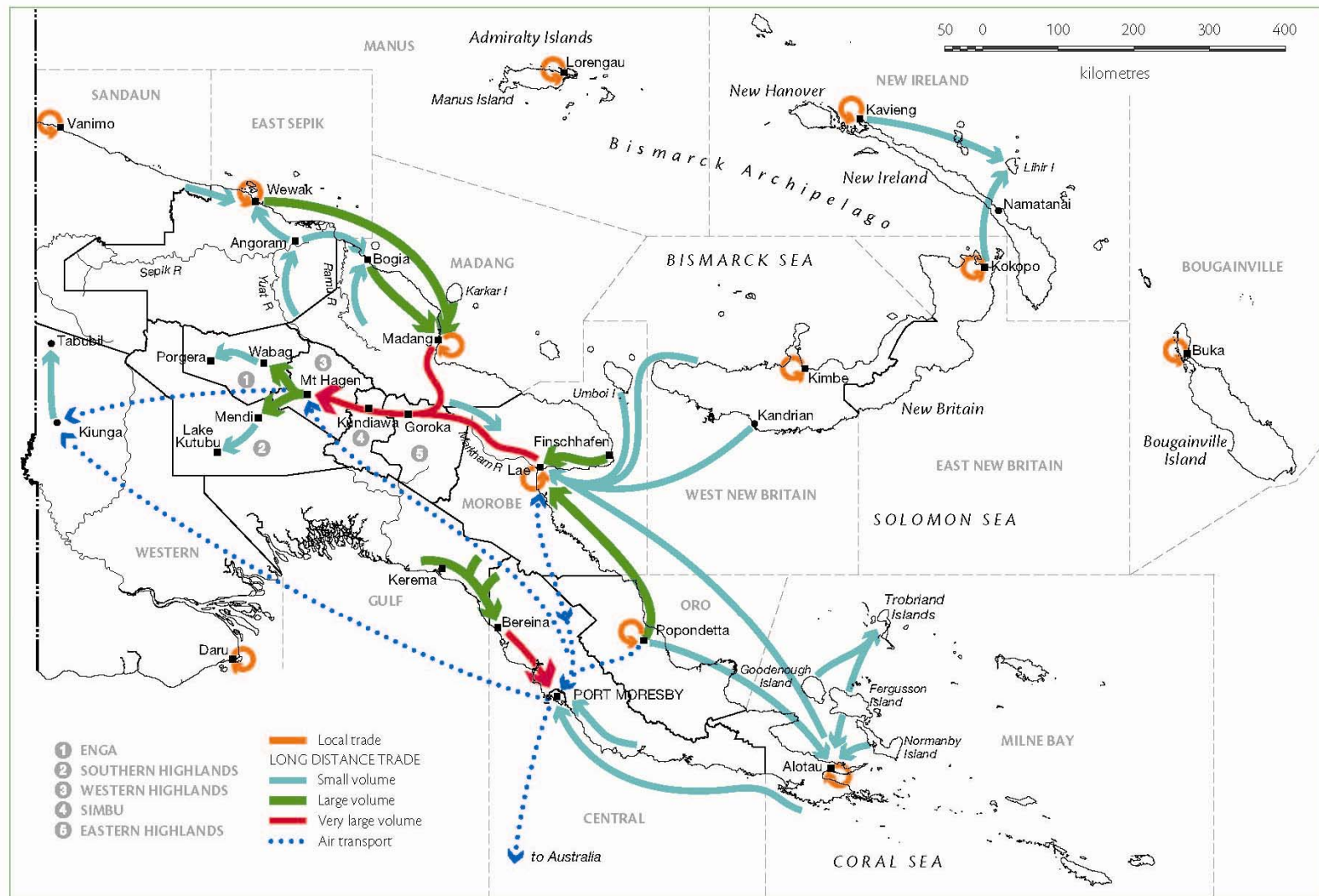




**Figure 5.2.3** Contribution by value of the main cash crops to agricultural exports by decade, 1951–2006  
Sources: Bank of PNG and various industry sources.

# Betel nut trade routes in PNG, 2007

Figure 5.17.2 Betel nut trade routes, 2007. Source: Author's observations and Tim Sharp (pers. comm.).



# Production trends for most important cash crops

- Arabica coffee – Static total production; declining plantation sector; slow growth of village sector
- Fresh food - Steady to fast expansion, especially since 1998
- Cocoa – Steady expansion, but declining plantation sector; return of village production in Bougainville
- Betel nut and pepper - Rapid expansion and domestic trade (urban, RNV and highland demand)
- Copra - Steep decline in copra exports, but copra oil steady
- Oil palm – Very rapid expansion of production (10% pa), with smallholders producing 33% of fresh fruit

# Smallholder agriculture

- Smallholder agricultural producers are dynamic
- Producers respond to both price signals and to marketing opportunities
- Over past 10-20 years, there has been expanded production of domestically marketed fresh food, betel nut, marijuana, oil palm, vanilla, cocoa, oil palm, peri-urban chickens and goats

# Influences on smallholder production and decision making

- Returns to labour are critical
- Marketing arrangements (eg chilli in early 1980s; copra in 2002; fresh food to Porgera in 2005)
- Adequacy of transport (roads and shipping)
- Information on marketing, prices, demand and production techniques
- Security for people and produce

# Gross returns on labour inputs for selected cash crops in PNG in 2007

Crop <sup>1</sup>	Mean yield (kg/ha)	Price (kina/ kg)	Gross return (kina/ ha)	Labour inputs (person- days/ha)	Return (kina per person- day)
Irish potato (tubers)	20,000	2.00	40,000	450	89
Oil palm (fresh fruit bunch)	15,000	0.25	3,750	70	54
<b>Sweet potato (tubers)</b>	<b>14,000</b>	<b>0.80</b>	<b>11,200</b>	<b>450</b>	<b>25</b>
Cocoa (wet bean)	800	1.00	800	40	20
Arabica coffee (parchment)	900	4.50	4,050	275	18
Rubber (cup lump)	650	1.60	1,040	100	10
Coconut (copra)	500	1.30	650	65	10
Robusta coffee (parchment)	900	1.60	1,440	275	5
<b>Rice (paddy)</b>	<b>1,300</b>	<b>0.80</b>	<b>1,040</b>	<b>215</b>	<b>5</b>
Pyrethrum (dried flowers)	650	1.50	975	430	2

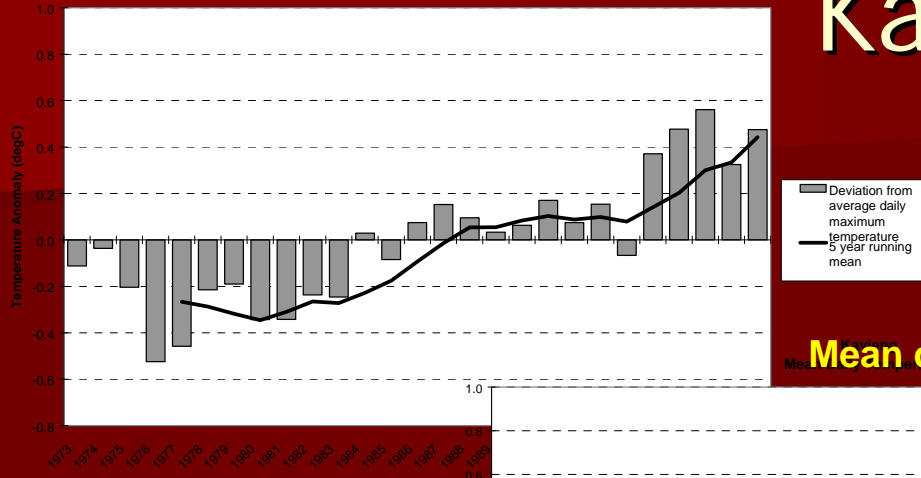


# Global climate change

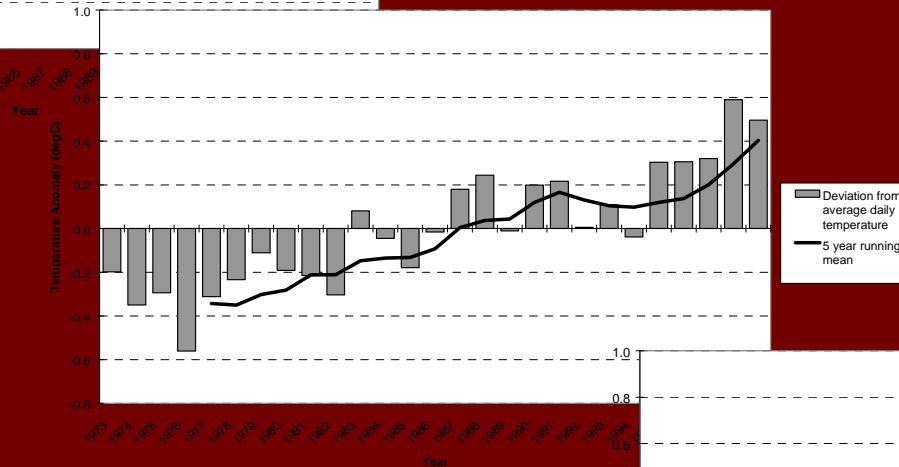
- The global climate is changing because of increases in greenhouse gases (carbon dioxide, methane, nitrous oxide)
- Impacts in PNG include:
- Temperature increases (Mean of 0.6 °C, 1970-1999, lowlands; somewhat greater in highlands)
- Sea level rises (now accelerating globally)
- Changing rainfall patterns; predicted increased rainfall for much of PNG – seems to be happening
- Possible higher frequency of extreme events (cyclone, drought, excessively high rainfall)

# Temperature change, Kavieng 1973-1999

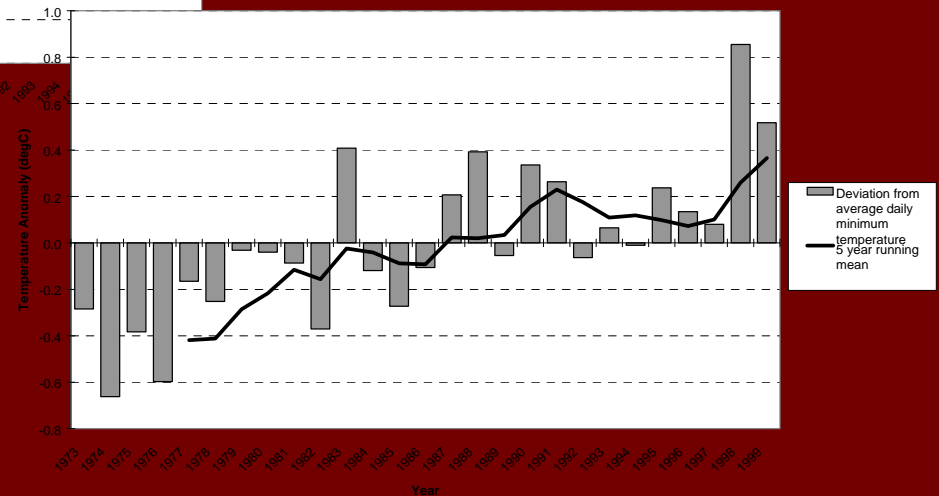
## Daily maximum temperature



## Mean daily temperature

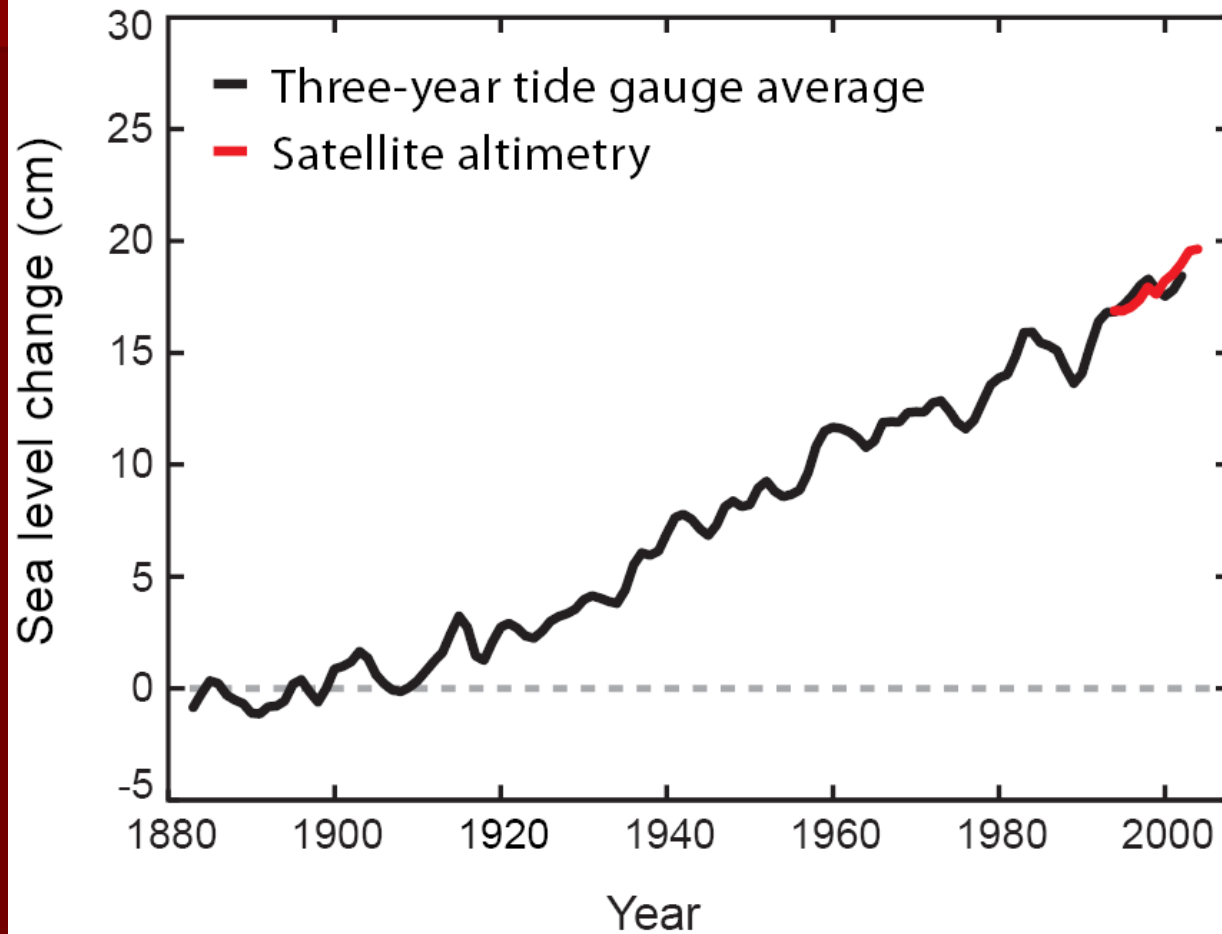


## Daily minimum temperature





# Sea level rise



# Current impact of climate change on PNG agriculture

- Crops now growing and bearing higher in the highlands (eg coconuts, betel nut, mango, breadfruit)
- Some damage to coastal locations, including atolls and very small islands
- Claims of 'sinking islands', food shortages on some islands (eg Duke of York IIs; Carterets)
- Changing production patterns, perhaps associated with changes in rainfall (eg reduced cocoa production in SW Bougainville)

# Potential impacts on PNG agriculture

- Crops will have higher altitudinal limits
- Greater incident of damage from extreme events (flood, excessive rainfall, drought, cyclone, high tides)
- Possible decrease in productivity in lowlands (eg cocoa, sweet potato)
- Small decrease in productivity in central highlands (1600-2000 m)
- Small increase in productivity at higher altitudes (2000-2500 m)
- Severe damage to many coastal locations, particularly atolls and small islands (eg swamp taro production)
- Changes in sea water salinity and increased acidity; damage to mangroves; and consequent negative impacts on marine life
- There are ca 100,000 people in PNG who live on small islands where population density is high
- Probably greater plant disease incidence with higher temperatures and rainfall (eg taro blight, coffee rust).

# Future prospects for PNG agriculture

- PNG smallholders have shown themselves adaptable and responsive to changing circumstances
- Good prospects for a number of products sold domestically and on the export market
- High returns on labour inputs are critical for success
- Also marketing arrangements

# New products: current research and development

- Cassava, sago, jatropha, castor, corn and copra for biofuel
- Cashew nut (Central and Western `Provinces)
- Kava
- Essential oils, such as cardamon, patchouli, nutmeg, citronella
- Bamboo for edible shoots and timber
- Non timber forest products, such as *marita* oil

# New products: current research and development (continued)

- Sago starch
- Sandlewood
- Peanuts
- *Galip* nut
- Noni
- Prawn farming
- Cut flowers for the domestic market

# Best prospects: domestic markets

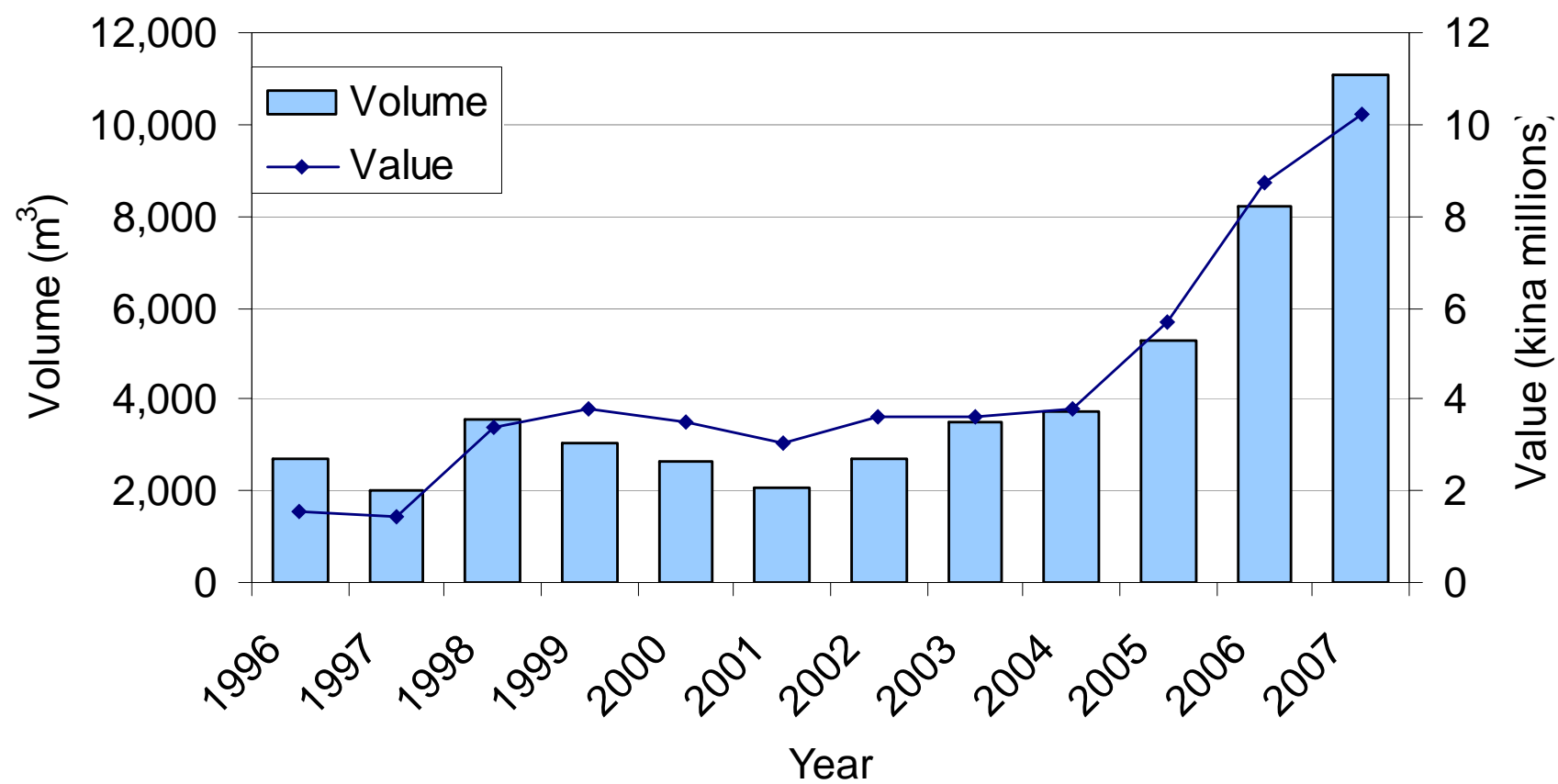
- Domestically marketed food, including root crops, banana, sago, fruit (mandarin, mango, rambutan, mangosteen, durian), indigenous edible nuts, vegetables
- Snack foods, such as peanuts, cassava chips, banana chips, *kaukau* chips, cooked *galip*, cooked *karuka* nut
- Betel nut and betel pepper
- Fish (fresh, dried)
- Livestock (pigs, chickens, goats)
- Flowers, particularly for funerals

# Best prospects: export markets

- Oil palm: current rapid expansion
- Hardwoods, including teak, *kwila*, New Guinea walnut (*mon*), *Calophyllum*, rosewood, *kamarere* and *ton*
- Fast growing timbers such as balsa, *Acacia mangium* and *Eucalyptus pellita*
- Flowers, particularly indigenous orchards
- Cocoa: Reasonable prospects, but depends on CPB
- Vanilla
- Other spices, particularly essential oils from spices
- Indigenous edible nuts (*galip*, *karuka*, *okari*, *pao*, *talis*)



Figure 5.13.1 Volume and value of balsa exports, 1996–2007



# Poor to average prospects: export markets

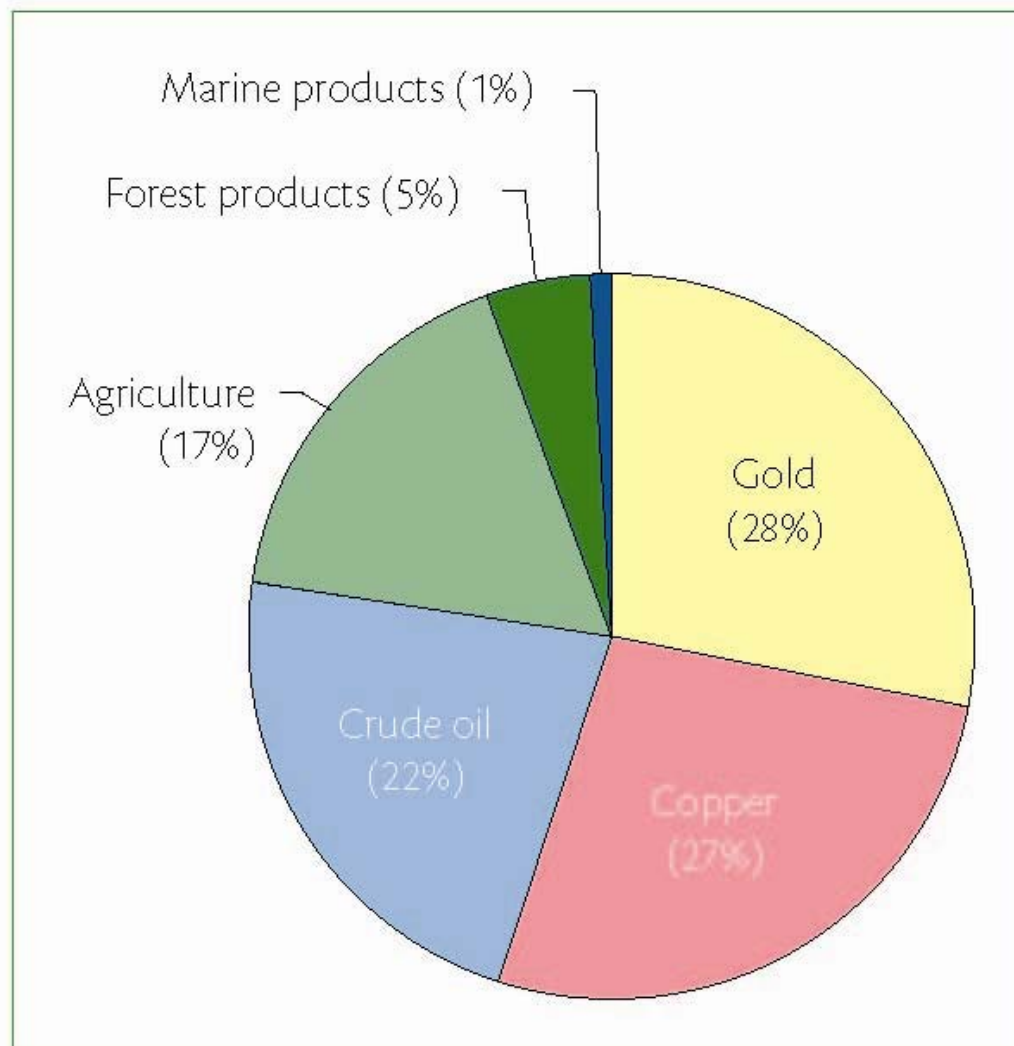
- Coffee: global supply is high, especially from Vietnam and Brazil. Quality problems in PNG
- Tea: global supply is high. Small size of PNG industry; now only one company in PNG
- Rubber: moderate prospects; depends on price of crude oil. PNG industry is static
- Copra: low prices; has to be exported as copra oil, with very limited market for copra now

# Very poor prospects

- Grains for domestic market, including rice, wheat, maize, sorghum (low returns on labour; huge past effort with little development)
- Pulses, such as soyabean, green gram
- Robusta coffee (low prices)
- Pyrethrum (very low returns)
- Fresh food exports (Significant quality, quarantine and transport constraints)
- Canned food for domestic market

# Role of agriculture in the PNG economy

- Agriculture provides >80% of food energy consumed
- Major source of cash income for most rural villagers
- Provides informal employment for many people (eg middlemen, transport, retailing of betel nut)
- Significant contributor to local development
- Useful contribution to export income (but just 17% of export income)
- Agriculture's greatest contribution is to food security, local and regional development, national stability, but not to export income



**Figure 5.2.1** Value of major exports, 2004–2006 (annual mean). Source: Bank of PNG.

# Concluding remarks

- PNG agriculture has bright future
- The mix of activities will be different in future decades, as it has been in past decades
- PNG agriculture needs to be supported by high class research and development
- It is important to build on current and past success and to learn from the past
- The new book *Food and Agriculture in Papua New Guinea* is a contribution to that process



# ***Em Tasol***

