FLEXIBLE AND ADAPTIVE LIVELIHOODS AMONG SMALLHOLDER PRODUCERS

A study of coconut selling and fresh food marketplaces in Papua New Guinea
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This report is part of a larger research project titled: “Strengthening livelihoods for food security amongst cocoa and oil palm farming communities in Papua New Guinea”. This research was a collaborative project between Curtin University, Papua New Guinea Oil Palm Research Association (PNGOPRA), the Cocoa and Coconut Institute Limited (CCIL) and James Cook University. Research funding was provided by the Australian Centre for International Agricultural Research (ACIAR).

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ISBN: 978-0-6455208-0-4

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www.pacificlivelihoods.com

Cover photos:
Kerevat market, ENB, 2015.
Kulungi roadside market, WNB, 2015.

Photograph sources:
All photographs from Tim Sharp unless otherwise stated.
Acknowledgements

The research in East New Britain was conducted in October-November 2015 by Robert Nailina, Esley Peter, Kathleen Natera, Jared Wennal and Alice Peter from what was then the Cocoa and Coconut Institute Limited (now Cocoa Board), assisted by Cornelia Kabala, Henry Karela, Lisa Seneka and Dorothy Wologa, and in partnership with Tim Sharp (Curtin University).

We are grateful for the support and assistance provided by Herman Valvalu, Monica Iwais and their colleagues at the East New Britain Provincial Market Authority.

The research in West New Britain was conducted in November 2015 by Emmanuel Germis, Jessica Bira, Josephine Misili, Rayleen Watson, Phillip Makai and Nathan Kapas from the PNG Oil Palm Research Association and Tim Sharp (Curtin University). Thank you to Luc Bonneau and Steven Nake (OPRA) for their support for the research.

We are grateful for the support of the administrators of the Kimbe Market.

The research in Milne Bay Province was conducted in September 2016 by Esley Peter, Kathleen Natera, Sharon Misiel, and Jared Wennal from what was then the Cocoa and Coconut Institute Limited (now Cocoa Board).

Thank you to Linda Browning (Curtin University) for her assistance.

Above all, thank you to the many vendors at all the marketplaces we surveyed in East New Britain, West New Britain and Milne Bay who were so generous with their time, and for their participation in the research. We are grateful for the field support provided by PNG Oil Palm Research Association and the Cocoa and Coconut Institute Limited. The research was funded by the Australian Centre for International Agricultural Research (ACIAR).
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### Abbreviations and Acronyms

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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ARoB</td>
<td>Autonomous Region of Bougainville</td>
</tr>
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<td>CB</td>
<td>Cocoa Board of PNG</td>
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<td>CCIL</td>
<td>Cocoa and Coconut Institute Limited</td>
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<td>CPB</td>
<td>Cocoa Pod Borer</td>
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<td>CRP</td>
<td>Customary Rights Purchase</td>
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<tr>
<td>ENB</td>
<td>East New Britain</td>
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<tr>
<td>FMS</td>
<td>Fair Merchantable Standard</td>
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<tr>
<td>FOB</td>
<td>Free-On-Board</td>
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<tr>
<td>KIK</td>
<td>Kokonas Industri Koporesen</td>
</tr>
<tr>
<td>LLG</td>
<td>Local Level Government</td>
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<tr>
<td>LSS</td>
<td>Land Settlement Scheme</td>
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<tr>
<td>MB</td>
<td>Milne Bay Province</td>
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<tr>
<td>NBPOL</td>
<td>New Britain Palm Oil Limited</td>
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<tr>
<td>NSO</td>
<td>National Statistical Office</td>
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<tr>
<td>PMV</td>
<td>Public Motor Vehicle</td>
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<tr>
<td>PNG</td>
<td>Papua New Guinea</td>
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<td>VOP</td>
<td>Village Oil Palm</td>
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<td>WNB</td>
<td>West New Britain</td>
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EXECUTIVE SUMMARY

In cocoa growing areas of Papua New Guinea (PNG), starting in 2012-13, researchers from the Cocoa and Coconut Institute Limited observed a marked increase in roadside and marketplace sale of dry coconuts for domestic consumption. In response, this study investigated the dry coconut trade at both large marketplaces and small roadside marketplaces in ENB, WNB and Milne Bay to understand the place of dry coconut sales within smallholders’ broader livelihoods, and to understand why smallholders were diverting their coconuts to the dry coconut market in preference to selling them as copra.

The study examined several potential explanations for the observed increase in dry coconut marketing. The first was that the rise of dry coconut selling was a response to low and fluctuating export commodity prices, particularly for copra. The second was that it was a response by smallholders to replace the loss of household income caused by the spread of cocoa pod borer (CPB), a pest which has devastated cocoa production in PNG following its incursion in 2006. Thirdly, the increased sale of dry coconuts may have emerged because it provided women with an independent, relatively ‘easy’ and regular income stream to meet ongoing household expenses. All of these factors were likely influential in different contexts, and so the study sought to understand the extent that each factor had stimulated dry coconut marketing at different times and at different locations.

Vendors sell a diversity of products (primarily fresh food), including dry coconuts, at large urban, district and oil palm estate marketplaces. Despite demand for dry coconuts and prices received at these marketplaces being high, the bulkiness of coconuts and high transport costs dissuaded many smallholders from selling dry coconuts at these large marketplaces. There was also evidence that these marketplaces were at times oversupplied with coconuts.

Marketing of dry coconuts occurs more commonly in coconut-oriented roadside marketplaces strategically located alongside major roads connecting urban centres with rural areas where there is strong demand for coconuts. In ENB, migrants to the new settlement belt, and who have had difficulty establishing coconut plantings, were the major consumers driving this trade. In WNB, demand was from migrant oil palm smallholders and oil palm milling company employees who have limited and insecure access to land for gardening and the planting of tree crops. Vendors at these marketplaces were mainly customary landowners, and mostly women. The average selling price at roadside marketplaces, and ultimately the money earned by roadside vendors, reflected both the overall wealth of the area and the local supply of coconuts.

The observed increase in trading of dry coconuts starting around 2012-13 could be explained by several factors. Smallholder commodity crop producers, including those producing copra, are sensitive to returns to labour and respond accordingly when there are price variations. For this reason, smallholders typically have a range of income sources, and allocation of labour shifts among these activities in response to changing returns to labour. The research findings indicate that at the time of the study, roadside dry coconut sales were in part a coping
strategy in response to low copra prices and vendors were taking advantage of the better returns from selling dry coconuts.

Following the collapse of household incomes resulting from the impact of CPB, and periodic low prices of copra, many women in ENB responded by increasing their participation in local marketplaces. Because many cocoa growers had coconut palms, as a shade tree, intercropped with their cocoa, selling dry coconuts was an easy alternative source of income that could be adopted immediately to reduce the impact of CPB on household income insecurity. For coconut vendors in WNB, most grew cocoa but oil palm was their major income source. Therefore, CPB was not having a significant effect on their household incomes. Dry coconut sales offered high returns to labour and a fast and regular source of cash income. Thus, the study’s findings indicate that the increased sale of dry coconuts to replace lost income from CPB was a strategy found only among ENB dry coconut vendors and not WNB vendors who had better income choices.

Dry coconut sales provide women with a modest income that can be earned frequently and relatively easily. Having the opportunity to sell dry coconuts is highly valued by women as many are compelled to seek supplementary incomes to meet immediate household needs and daily living costs. Most women are able to control the money they earn in marketplaces, unlike the income earned from commodity crops which is mostly controlled by men. Roadside selling also provided a means for women to earn money, that could readily accommodate their other responsibilities including child care.

There was no evidence from this research to suggest that the dry coconut market presents significant competition for the supply of coconuts to the copra market. Marketing of dry coconuts is not lucrative. However, it does make an important contribution to supplementing women’s incomes, particularly due to it being a regular source of income, amongst those households able to access this livelihood opportunity.

Despite low incomes from coconuts, in the form of both copra and dry coconut sold in marketplaces, the report emphasises the importance of coconuts to livelihoods. The flexibility of coconuts as a crop – being able to be used for household consumption and other household uses, and sold both internationally and domestically – means the crop makes a valuable contribution to household resilience and food security, and smallholders’ capacity to adapt in response to different threats to their livelihoods.

The report also documents some important changes in fresh food marketplaces in PNG, including the rise of marketplace reselling by urban resident vendors, and an increased sale of manufactured goods in marketplaces. In addition, the research documents the growing importance of income from roadside marketplaces for rural villagers living along major roads linking urban and rural areas. The study reaffirms the prominent role of women in the country’s marketplaces.

This study formed part of a larger investigation of food and income security among cocoa and oil palm smallholder households that examined the changing farming and livelihood systems of smallholders and the capacity of smallholders to adapt and respond to economic, demographic and environmental stressors (see Koczberski et al. 2019).
1. INTRODUCTION

1.1. Study Background

This report provides an overview of the current nature of the domestic trade in dry coconuts and the importance of fresh food marketplaces to household livelihoods and food security in PNG. It documents findings from surveys conducted in 2015 and 2016 on the sale of coconuts at 16 local marketplaces in the cocoa/copra and oil palm producing areas in East New Britain (ENB), West New Britain (WNB) and Milne Bay (MB) Provinces. The study was at the request of the PNG Cocoa and Coconut Institute Limited (CCIL). Their interest was in response to an observed increase in 2012 and 2013 in the roadside and marketplace sale of dry coconuts by smallholders, as opposed to the sale of copra. At the time, there had been no detailed study of the extent or changing nature of the trade in dry coconuts in PNG.

The study formed part of a larger investigation of the status of food and income security among cocoa and oil palm smallholder households that examined the changing farming and livelihood systems of smallholders and the capacity of smallholders to adapt and respond to economic, demographic and environmental stressors. In cocoa growing areas, the main stressor for cocoa growers has been the impacts on livelihoods and incomes following the incursion of the pest, Cocoa Pod Borer (CPB) (*Conopomorpha cramerella*), in 2006 in ENB. The pest has devastated smallholder cocoa production throughout the country (see Curry et al. 2012; Curry et al. 2015). A further stress upon cocoa growers – who also produce copra from the coconut palms that are typically intercropped as a shade tree with cocoa – has been declining incomes from copra due to periodic low prices leading to poor returns on labour, and due to declining copra yields from aging palms. In the oil palm growing areas of WNB, smallholder livelihoods have been under stress due to rapid population growth leading to falling per capita oil palm incomes and declining access to land for food gardening. This has placed great pressure on families to diversify their income and livelihoods, and adapt their gardening systems (see Koczberski & Curry 2005; Koczberski et al. 2018).

Whilst dry coconuts have always been sold at both village and urban marketplaces, the study was to identify the reasons underlying the observed increase in dry coconut sales and the role coconut sales play within smallholders’ wider livelihood practices. In particular, answers were sought to understand why smallholders were diverting their coconuts to the dry coconut market in preference to selling them as copra or other coconut products. This was occurring

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1 In 2017 CCIL was subsumed into the Cocoa Board (CB) of Papua New Guinea and Kokonus Indastri Koporesen (KIK). Cocoa research is undertaken by the Research Extension and Development Services (REDS) of the Cocoa Board of PNG. Coconut research and support to farmers is carried out by the Kokonas Indastri Koporesen (KIK).

2 ASEM/2012/072 *Strengthening livelihoods for food security amongst cocoa and oil palm farming communities in Papua New Guinea*. Australian Centre for International Agricultural Research, Canberra, ACT. See Koczberski et al. 2018.
at a time when the coconut industry in PNG had been supporting and promoting the sale of high-value coconut products, such as virgin coconut oil.

Although the observed increase in dry coconut sales by CCIL coincided with particularly low copra prices, the research sought to answer the following questions. To what extent were dry coconut sales:

1. A coping strategy by smallholders to adapt to low and fluctuating agricultural commodity prices?
2. An important source of income for cocoa smallholders to replace that lost due to CPB?
3. An ‘easy’ supplementary income source for women to maintain household food and income security?

The report begins with a background on the role of coconut production in smallholder livelihood systems, followed by a description of the fieldwork and methods. The findings of the market surveys conducted in ENB, WNB and Milne Bay are then presented, first for large marketplaces and then for smaller roadside marketplaces. The final chapter summarises the results, addresses the three questions posed above and briefly discusses the future prospects of dry coconut trading and the changing nature of marketplaces in PNG. Throughout the report, some data on coconut production, consumption and marketing from the broader food security study are also presented.

1.2. The significance of the coconut in PNG village life

Coconut palms, *Cocos nucifera*, are an integral part of peoples’ livelihoods in PNG and play a significant role in the social and cultural aspects of village life (Evans 2020; Rollason 2014). They are prevalent in almost all villages in the PNG lowlands. Over a third of rural households grow coconuts (Bourke & Allen 2009:195). In the most recent PNG Census in 2011 (NSO 2015:80), 36% of rural households reported to grow coconuts for either consumption or sale. Twenty nine per cent of these households (11% of all rural households) earned some income from selling coconut products (primarily copra, dry coconuts, and green coconuts) (see KIK 2016:xi). Although coconuts are very widely grown, the locations where households earn income from copra is more geographically restricted (Figure 1.1). Dry nuts and green immature coconuts are widely sold in marketplaces throughout the lowlands. Dry coconuts are also regularly traded to marketplaces in the highlands.

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3 The mean usual altitudinal range for coconut is 0-950 m.a.s.l. (Bourke 2010:487)
4 Similar estimates emerged from the *Mapping Agricultural Systems in Papua New Guinea* project in the early 1990s. It estimated 37% of rural households grew coconuts (Bourke & Allen 2009:195), and 16.6% of the rural population produced copra. At the time copra was estimated to represent 8.1% of total rural income (Allen et al. 2009:286).
Coconut cream/milk is commonly incorporated into meals in the coastal lowlands where coconuts are primarily grown. It is one of the main dietary sources of fats and oils (Bourke et al. 2009:130). In addition, green or immature coconuts are often used for coconut water, a popular hydrating drink. Akus et al. (2001:834) reported about 300 million coconuts (both green and mature nuts) were consumed each year in PNG. Based on the 1996 PNG Household Survey, an estimated 28% of the rural population, and 34% of the urban population, consume coconuts (Gibson 2001:47). Dietary recall surveys carried out in 2014 among cocoa and oil palm growing households in ENB, WNB and Milne Bay asked respondents to list the ingredients used in the previous evening’s meal. Approximately 75% of the cocoa smallholder households sampled across the two sites in ENB and Milne Bay and around 50% of oil palm smallholder households consumed coconut in some form in the previous evening’s meal (Figure 1.2) (Koczberski et al. 2019). A seven-day dietary recall survey was also conducted on a subset of these same households and on average coconut products were consumed by at least one family member six days out of seven (Koczberski et al. 2019). Consumption of dry coconuts is also increasing in the highlands as dry coconuts are now transported in large volumes to marketplaces in this region, a trade that was emerging by the late 1970s (Bourke 1986). In addition, as a result of a warming climate, coconuts are now bearing at some higher altitude sites, a phenomenon unheard of previously (Bourke 2010:281-2). However, the level of production in the highlands remains extremely low.
Many parts of the palm are used on a daily basis in rural villages. The husks and shells are a source of mulch and fuel for cooking, the shells are used as food bowls, and in many lowland areas coconut ‘meat’ is a major source of food for pigs (Hide 2003:58-61). Coconut fronds and husks are also used widely in the construction of houses, utensils, such as brooms and baskets, mats, rope and crafts.

The ability of coconut palms to withstand harsh climatic conditions makes coconut a particularly important source of food and refuge for coastal and island communities (Foale 2003:5). Coconut palms have many physiological traits that allow them to endure periods of water deficiency (Gomes and Prado 2007). During the 1997 El Nino induced drought, coconut showed tolerance to the extreme conditions and alleviated some of the food shortages of the coastal regions (Akus et al. 2001). In Central Province many rural households that had not used their coconut palms as a source of cash income for many years returned to making copra. This was the only way for them to earn income to purchase food and meet basic household needs as no other cash crops were available and food gardens were unproductive (Inape and Humphrey 2001; Omuru 2000).

### 1.3. Threats to coconut cultivation

Coconut is difficult to grow in some coastal areas of PNG due to the presence of the coconut rhinoceros beetle, *Oryctes rhinoceros*. The pest causes significant damage to coconut palms, particularly young palms. The beetle was introduced to New Britain Island during the Second World War and has subsequently spread to other locations throughout the lowlands (Catley 1969:20). The adult beetle bores into the growing portion of the palm causing wedge-shaped
cuts in the base of unfolded fronds. This can cause the palm to die or increase exposure to secondary pests and diseases.

A more recent threat to coconuts in PNG has been the discovery of Bogia Coconut Syndrome. It is a lethal yellowing disease (LYD) caused by phytoplasmas, a group of insect-transmitted bacteria. Palms are susceptible at all growth stages. This disease was first reported to KIK in 2007 by farmers in the Bogia District of Madang Province (CCIL, 2011) and is also present in Sumkar and Madang Districts of the Province (Gurr et al. 2020). Prior to its identification in 2011 the disease had caused severe losses to coconut palms in the Bogia District (Kelly et al. 2011; KIK 2016). A 2020 survey of coconut plantations in Madang Province estimated 190,000 palms had been lost (Gurr et al. 2020). To date Bogia Coconut Syndrome has been confined to Madang Province. But its spread has the potential to be a substantial threat to the food security of families across PNG as it is suspected that its host range is not confined to coconut palms but may also include banana, taro, betel nut (*Areca catechu*) and oil palm (*Elaeis guineensis*) (Gurr et al. 2016:4, 9; KIK 2016).

### 1.4. Smallholders and the coconut industry in PNG

From a commercial perspective the primary sources of income from coconut palms are derived from the nut in products that include copra (the dried flesh of the coconut), copra oil and copra meal (Allen et al. 2009). Smallholders generally sell copra to a mill/exporter. The exporter then exports it as copra, or processes the copra and exports it as copra oil and copra meal. Trading coconuts to make copra was the impetus for many foreigners to settle in PNG in the 1880s. Consequently, extensive areas of palms were planted and copra became the first major cash crop in the country (Bourke 2009). Copra was the most important cash crop until the 1950s, with most coming from plantation production on the coastal lowlands of the mainland and island regions (Bourke 2009:19).

After the 1950s the smallholder sector expanded and coconut/copra production became a primary, and sometimes sole, source of income for many coastal and island communities (Plate 1.1). At the same time the plantation sector was in decline as a result of severe price fluctuations in world markets and increasing costs of inputs (Allen et al. 2009:323-330). The proportion of national copra production coming from smallholders increased rapidly from around 40% in the mid-1970s, to around 70% by the late 1980s and 82% in the late 1990s (Allen et al. 2009:324, 326). The share of export earnings collectively from copra and copra oil declined with the development of the coffee, cocoa and mineral industries during the period from the 1950s to 1970s (Allen et al. 2009:324). From the 1970s to 1990s copra production in PNG declined significantly. This was due to a combination of interrelated factors including: international price volatility, poor returns on labour, closure of buying

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5 Virgin Coconut Oil manufacturers accept supply from general smallholders at their factories. In recent years, in response to organic certification requirements, these manufacturers have also established supply partnerships with particular farmer groups.


Prices for coconut products have continued to fluctuate from the 1990s to the present (Figure 1.3). Smallholder copra producers are sensitive to price variations and respond accordingly (Allen et al. 2009: 411-14; Fleming 1999). The intensive labour requirements of copra production means that when prices are low returns to labour are non-viable (see below). Prices began to increase from 2006 with a corresponding increase in production. A glitch in this response resulted from the Global Financial Crisis in 2008-09 and after the market recovered, production increased up until 2011. In 2012 and 2013 enthusiasm for copra was again tempered by declining prices. Recovery by volume from this drop in production was not as strong as the rise in price, possibly because exporters were taking a greater margin as shown in the difference between export (Free-on-board – FOB) and millgate (Fair Merchantable Standard – FMS\(^6\)) prices from 2013 (Figure 1.3). On average, from 2003-2012 smallholders received 76% of the export price of copra. However, from 2013-2019 the smallholder share of the export price dropped to 60%. The reason for this is unknown. The change coincides with an increase in the proportion of copra exported as copra oil. It is unclear if the change is in response to increased operating costs, or fixed costs that need to be recovered from much lower production levels.

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\(^6\) FMS: Fair Merchantable Standard is the average price received by the farmers at the exporter’s or factory gate.
The price of copra (in kina terms) has generally increased over time (Figure 1.3) but, the purchasing power of copra smallholders has not. This is influenced by international prices for imported items and copra, and the relative value of the kina to other currencies. Figure 1.4 shows, over time, how much rice a smallholder could purchase if they sold a tonne of copra. Rice is an important item of purchase for rural Papua New Guineans and a commodity that broadly reflects the cost of imports in the country. The relative value of copra in terms of imported rice has been variable, though smallholders’ purchasing power through the 2000s until around 2014 was much lower than in the 1990s, prior to the devaluation of the kina. In the last few years copra prices have improved copra smallholders’ purchasing power. What a smallholder can do with the income from their hard work is important for understanding smallholders’ variable and waning interest in copra.

Figure 1.3. Copra production levels and export and millgate prices, Papua New Guinea, 1990-2019.

Data source and notes: Copra and copra oil production figures, and copra export (FOB, Free-on-board) prices from Bank of Papua New Guinea (2020). Copra oil production is shown as the copra equivalent calculated based on the copra extraction rate of 61% (World Bank 1985). The combined copra production and copra oil (copra equivalent) approximates the production of copra delivered to the mill, both smallholder and plantation. The copra mill-gate (FMS, Fair Merchantable Standard) price data is from the Kokonas Indastri Koporesen and is the average price paid to smallholders at the mill. FOB and FMS prices are annual averages.
Figure 1.4. National copra production and the amount of rice a smallholder can purchase if they sell a tonne of copra, PNG, 1990-2019.

Data source and notes: The graph shows the change in the value of copra relative to rice over time, and this is shaped by the copra price and the price of rice, both of which are influenced by the value of the kina (PGK) relative to other currencies. The value of the kina declined significantly in the late 1990s. Copra and copra oil production figures from the Bank of Papua New Guinea (2020). Copra oil production is shown as the copra equivalent calculated based on copra extraction rate of 61% (World Bank 1985). The combined copra production and copra oil (copra equivalent) approximates the production of copra delivered to the mill door, both smallholder and plantation. The copra mill-gate (FMS, Fair Merchantable Standard) price is the average price paid to smallholders at the mill. FOB and FMS prices are annual averages. Data from the Kokonas Industri Koporesen. Data on the price of rice is from the National Statistical Office, Consumer Price Index Basket of Goods, Port Moresby. The bulk of rice consumed is imported.

Many households continue to produce copra, especially in areas where CPB remains a problem or where alternative income sources are limited. Data from household surveys conducted in 2014 as part of the Food Security Project (Footnote 2) revealed that a significant percentage of cocoa and oil palm growing households regularly earned income from copra, though this data does not reveal the scale of production. In Rabagi (ENB), copra was the second highest source of income for 71% of households after fresh food sales, and in WNB villages near Hoskins, 46% of men ranked copra as their second most important income source after oil palm. ENB, ARoB and WNB continue to be major copra producing regions.

In terms of revenue the coconut industry is the fourth largest contributor to agricultural export income (AECOM 2017), yet this contribution is less than 10% of the total. In recent times KIK has been promoting the production of high value coconut products such as cosmetics, cooking oil and biofuels. At the same time the PNG Government has been employing initiatives focused on streamlining research and development (KIK 2016). The aim
of these promotions and initiatives is to increase returns to producers. Because of this industry support, the production of coconut products is expected to expand (AECOM 2017).

A constraint on the expansion of the coconut industry is the ageing of existing coconut stands. Most smallholder coconut palms are relics of the early profitable trading years and have reached the senile phase. Between 1910 and 1940, just under 106,000 ha of coconut palms were planted, with these amounting to 40% of the coconut plantings in existence in 2001 (Ollivier et al. 2001:659). Hence production per palm is low. For vendors interviewed for this study, 63% indicated that the majority of their household’s coconut palms were more than 40 years old (Figure 1.5).

The rehabilitation of old coconut stands is a priority of the industry (CCIL 2011). In 2016, KIK initiated a coconut replanting project in Gulf and Central provinces and this has expanded to the New Guinea islands and Momase region (KIK 2021). However, overall there are few incentives for growers to replace senile palms. The reluctance to replant stems from a range of interrelated factors including:

- Continued price volatility of copra since the 1990s
- Poor returns to labour. Copra production is very labour intensive as the nuts need to be dehusked and split, the meat removed and then dried (Allen et al. 2009:327). The intensive labour requirement of copra production means that when prices are low returns to labour are non-viable and smallholders respond accordingly.
- The new shorter and higher yielding coconut varieties typically require more inputs and more intensive management (Warner et al. 2007:62). These are negative attributes in a low input system of agriculture where available household labour is often limited (see Curry et al. 2007)
- The accompanying loss of production and income from both the old coconuts and any intercrops (Warner et al. 2007:ix)
• The presence of the coconut rhinoceros beetle in some areas. Its impact on young seedlings can be more severe than on adult palms reducing yields and ultimately killing the seedlings (Chakravarthy et al. 2014). This had reportedly made it particularly difficult for people who had moved onto resettlement blocks near Warangoi (ENB), following the 1994 volcanic eruption, to establish coconut plantings. Today they are major purchasers of dry coconuts on the Gazelle.

Despite coconut producers being susceptible to fluctuating prices they have flexibility in their engagement with the market. They tend not to collect all fallen nuts and they have the ability to simply reallocate their labour between enterprises such as food production, cocoa production and other cash earning activities when economic and environmental circumstances change. This was evident when, following the collapse of the Copra Marketing Board (CMB) in 2001, copra production further declined as producers lost access to markets and were not paid in full by the Board (Warner et al. 2007:26, 37). Smallholders turned their attention to other income generating activities, such as oil palm in WNB. In areas where producers do not have access to markets for consumer goods they will only supply sufficient produce to meet their cash requirements (Warner et al. 2007:26-7). Fluctuations in smallholder production is typically in response to relative returns on labour as discussed in Sections 1.4. and 1.5 below.

1.5. Coconut and cocoa

Around 80% of cocoa grown in PNG is intercropped with coconut (J. Nightingale, Agmark, pers. comm. cited in Warner et al. 2007:24).8 The innovation of intercropping coconut with cocoa was adopted in the preliminary years of cocoa production in the 1950s. By 1969 export income from cocoa surpassed that of copra for the first time and continues to do so (Figure 1.6). In the early 2000s, copra production was at an all-time low due to low copra prices and strong cocoa production (Allen et al. 2009:316, 324).

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8 In some cocoa growing areas intercropping with coconut is not possible due the presence of the coconut rhinoceros beetle (Curry et al. 2007:57).
As a shade tree for cocoa, coconut is particularly suitable for low labour input farming as it provides consistent shade and requires little maintenance with the added benefit of being a source of income (Curry et al. 2007; Benton and Belfield 1995). An additional advantage is that cocoa grown under coconut palms has less incidence of pests and disease (Smith 1981). Cocoa block management, including weeding, soil management and application of fertilisers, also benefits the coconut palms (Warner et al. 2007:25).

Intercropping cocoa with coconuts provides an opportunity to maximise productivity per unit area of land (Allen et al. 2009) and increases income security if one crop fails, or if one crop experiences a period of depressed prices. This was evident with the arrival of the Cocoa Pod Borer (CPB) in PNG when cocoa production plummeted (Figure 1.7). In the two main cocoa producing provinces of ENB and the Autonomous Region of Bougainville (ARoB), where coconuts are a major shade crop, many households temporarily switched their labour to copra production. For men in Tinputz District of ARoB, copra replaced cocoa as their primary source of income following the outbreak of CPB until cocoa incomes were restored (Peter et al. 2017) (Table 1.1). Similarly in Rabagi village on the Gazelle Peninsula, men became more reliant on copra as their main income source (Table 1.1). In contrast, at Tavilo where cocoa growers had received early support from the private sector to control CPB, cocoa remained the major source of income for men (Table 1.1). The increase in copra production was supported by, for the most part, higher copra prices (Figure 1.7). As mentioned previously, however, this resurgence in copra production was not sustained in part because the returns to smallholders remained low, with increased exporter margins mostly absorbing the higher FOB prices. Copra and copra oil production remained low for most of the period between 2013 and 2019 (Figure 1.4).
Table 1.1. Most important income source for men (and percentage of men reporting that source as their most important source of income) immediately after the CPB incursion and in 2014, ARoB and ENB.

<table>
<thead>
<tr>
<th></th>
<th>ARoB</th>
<th>ENB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Iris (Tinputz)</td>
<td>Kosina-mohina (Tinputz)</td>
</tr>
<tr>
<td>Immediately after CPB incursion</td>
<td>Copra (22%)</td>
<td>Copra &amp; Fishing (22%)</td>
</tr>
<tr>
<td>2014</td>
<td>Cocoa (53%)</td>
<td>Cocoa (75%)</td>
</tr>
</tbody>
</table>

Source: Peter et al. 2017:12

Figure 1.7. ENB cocoa and copra production volumes and copra FMS price 2002–2019.
Sources: Cocoa Board of Papua New Guinea 2018; KIK 2016:18; KIK Quarterly Market Reports 2017-2019; Bourke and Harwood 2009:555, 560
1.6. Oil palm prices and coconut selling

Many smallholders have diverse strategies for maintaining their livelihoods. One of these strategies is to diversify income to reduce their vulnerability to fluctuations in the price of cash crops. An example of this was in 2000 when oil palm prices dropped below K80/tonne. Households had the flexibility to access income from other sources with a major source being the sale of produce at local marketplaces. The produce included garden foods, betel nut and dry coconuts (Koczberski et al. 2001:65). In 2015 oil palm prices were again on the decline (Figure 1.8) from a peak in 2011. In household surveys conducted in 2014 as part of a Food Security Project (see footnote 2), marketing of produce at local marketplaces was an important source of income. Amongst other food items marketed, dry coconuts were sold by almost 35% of households living on Village Oil Palm (VOP) blocks and 21% on the Land Settlement Schemes (LSS) \(^9\) around Hoskins, WNB.

![Figure 1.8. Average oil palm Fresh Fruit Bunch (FFB) price, WNB, 2000 to 2017.](image)

*Source: New Britain Palm Oil Limited (NBPOL)*

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\(^9\) In West New Britain, oil palm smallholders are categorised into three groups based on their block residence type as either 1) Land Settlement Scheme (LSS), 2) Village Oil Palm (VOP), or 3) Customary Rights Purchase (CRP). LSS blocks were established in the late 1960s and early 1970s, and settlers from elsewhere in PNG were granted long-duration 6 ha state agricultural leases to establish oil palm smallholdings. Local customary landowners were later incorporated as oil palm smallholders under the VOP Scheme. More recently blocks acquired on customary land by people (mostly migrant settlers) not part of the customary landowning group have been planted to oil palm and these smallholdings are termed CRP blocks (See Koczberski et al. 2012; Germis 2019).
1.7. Dry coconut selling

Dry coconuts and drinking coconuts are common items in lowland marketplaces, and have been so since the earliest urban marketplaces were established during the colonial period. In the lowlands, most marketing of coconuts is small in scale and, as with fresh food marketing in general, is predominantly done by women. Coconuts are sold in urban marketplaces, from the large main marketplaces to small corner marketplaces. They are also sold in rural roadside, village and oil palm estate marketplaces. In the lowlands, coconuts are frequently sold concurrently with other garden produce although, as this report details, some specialisation occurs in large urban markets as well as in some small rural roadside marketplaces. Some vendors may only have a few palms for household use and marketing, while other households have large coconut plantings grown primarily to produce copra. Households may both produce copra from their coconuts as well as sell dry coconuts and drinking coconuts in marketplaces.

Coconuts have been transported in quantity to the highlands since the late 1970s, and the scale of this has increased in the 2000s and 2010s. Large volumes of coconuts from Madang and Morobe Provinces are now sold in marketplaces in the highlands region by wholesale resellers (Plate 1.2).\(^{10}\) Coconut sellers in the highlands marketplaces tend to be specialist coconut resellers rather, and so tend not to also sell other items.

Plate 1.2. Wholesale dry coconut sales in Mt. Hagen Market, 2007 (The large white bags are filled with husked dry coconuts).

\(^{10}\) See Barnett-Naghshineh (2019:231-232) for an account of a coconut vendor in the Goroka Market.
1.8. The significance of marketplaces for export crop smallholders in PNG

The sale of dry coconuts fits into the widespread selling of fresh produce at marketplaces in PNG. Throughout the country, the sale of fresh food and betel nut in marketplaces is critical to livelihoods (Busse and Sharp 2019; Sharp and Busse 2019). More people earn money from selling in marketplaces than from any other source. An estimated 94% of rural households earn income from fresh food sales (Allen et al. 2009:286). In the major export cash cropping regions, such as those sites included in the present study, the income from the sale of oil palm or cocoa is the most important source of income for smallholder households. Marketplace selling is often the second or third most important source of income for these households, and is valued because of its flexibility, and the regularity with which money is earned, as opposed to the more periodic returns from export crop sales (see Section 1.5).

Fresh food marketplaces are particularly important for the incomes of women, who make up the great majority of vendors in PNG’s marketplaces (see Barnett-Naghshineh 2019). In household surveys conducted with cash crop smallholders, fresh food marketing was the most important income source for 50.5% of women in cocoa producing households surveyed in ENB, 58.5% of women in coffee growing households in the Eastern Highlands, and 21.5% of women from oil palm producing households in WNB (Table 1.2) (Curry et al. 2019:241).

Table 1.2. Most important income source for cocoa, coffee and oil palm smallholders by gender (per cent of households)11

<table>
<thead>
<tr>
<th></th>
<th>Cocoa households ENBP (%)</th>
<th>Coffee households EHP (%)</th>
<th>Oil Palm households WNB (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
<td>Men</td>
</tr>
<tr>
<td>Export cash cropping</td>
<td>85.5</td>
<td>35.5</td>
<td>81</td>
</tr>
<tr>
<td>Fresh food marketing</td>
<td>1.1</td>
<td>50.5</td>
<td>8</td>
</tr>
</tbody>
</table>


Surveys from the wider Food Security study (Koczberski et al. 2019:35-6, 43-4) reported that in the oil palm belt of WNB, for most women the sale of food crops was the second most common income source, though 25% of women in Hoskins and 18% of women in Bialla ranked food sales as their most important income source. Amongst LSS households in Hoskins and Bialla, 46% and 26% respectively, had marketed food in the past 7 days. Amongst both VOP and CRP household groups, 32% had marketed in the past 7 days.

11 Cocoa data collected in 2004 from 93 households in four villages in the Local Level Governments of Kokopo Vunamami and Livuan-Reimbar, Gazelle Peninsula, ENB. The data were collected prior to the Cocoa Pod Borer incursion in 2006. The pest has since decimated cocoa production in ENB. Coffee data collected in 2010 from 194 households in Asaro and Bena villages in EHP. Oil palm data collected in 2014 from 181 smallholder households residing on the Hoskins and Bialla land settlement schemes, WNB.
In the cocoa producing region of ENB and Milne Bay, where CPB is present, food sales in marketplaces is very important in maintaining household income security. In ENB, in 2014 marketing food was the primary source of income for 58% of households at Lamarainam, 81% of households at Rabagi, and at Tavilo fresh food marketing was the second most important source of income for 71% of households. In Rabagi, 32% of households had sold fresh food in the past week, while at Lamarainam 12% had done so and at Tavilo 13% (Koczberski et al. 2019:43-4). In Milne Bay amongst cocoa producing households, 84% of households at Boiou and 96% of households at Kaubwaga reported fresh food marketing as their most important income source, with 33% of Boiou households and 39% of Kaubwaga households reporting to have sold fresh food in the past 7 days (Koczberski et al. 2019:43-4).
2. INVESTIGATING THE DRY COCONUT MARKET

2.1. Fieldwork and methods

This report is based on market surveys conducted in early November 2015 in ENB and WNB and in late August to early September 2016 in Milne Bay (Figure 2.1). The ENB marketplaces were located in cocoa growing districts on the Gazelle Peninsula although oil palm plantings were beginning to expand in the area at the time of fieldwork. Those in Milne Bay were in locations growing both oil palm and cocoa. The WNB marketplaces were in predominantly oil palm growing areas around Hoskins and Kimbe, although there are still some households producing cocoa. Despite oil palm replacing coconut plantings in many parts of Kimbe Bay, in some locations significant coconut plantings remain, although copra production is low.

Figure 2.1. Provinces and major towns, Papua New Guinea.
Source: Map reproduced with the permission of CartoGIS Services, Scholarly Information Services, The Australian National University. https://creativecommons.org/licenses/by-sa/4.0/. Adapted to show Hoskins region and Gazelle Peninsula.

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12 In 2015 and 2016, the period in which this study occurred, an El Nino event led to widespread drought, and frosts at higher altitudes, across Papua New Guinea. This threatened food security in many parts of the country. The field sites for this study, however, were amongst the least impacted areas in the country (Bourke et al. 2016). Rural people reported dry conditions, impacts on certain crops and shortages of some crops in the marketplaces, however these impacts were relatively minor. In ENB and WNB at the time of the surveys the marketplaces were well supplied with food.

13 In 2006, c. 85% of households in the Kulungi area had coconut plantings that were not currently used for copra production (Koczberski et al. 2006:60).
Data were collected in ENB and Milne Bay by a team of researchers from the then CCIL, Tavilo, ENB and in WNB by a team from the PNG Oil Palm Research Association (PNGOPRA). Surveys in ENB and WNB were conducted in collaboration with Tim Sharp (Curtin University). Survey data were collected from large marketplaces including urban and oil palm estate marketplaces and small village-based roadside marketplaces. At both large marketplaces and small village-based roadside marketplaces two types of surveys were conducted:

1. Dry coconut vendor surveys

Vendors selling dry coconuts were surveyed to collect individual demographic and socio-economic data, residence location and information on why they sold dry coconuts, marketing and labour practices, expenses and incomes, and the role of coconut sales within wider household livelihood practices. A total of 129 coconut vendors were surveyed. A high proportion of vendors selling dry coconuts were surveyed, in some cases all coconut vendors present on the day, nevertheless the total numbers surveyed at some markets were small (see Table 2.2). Hence, care should be taken in its interpretation.

2. Whole market surveys

Whole market surveys were conducted to provide wider context for the sale of dry coconuts and identify where the sales fitted into the whole market structure. This survey collected data on the total number of vendors, their gender, residence and province of origin, the types of produce being sold, frequency of market attendance, whether the vendor grew the produce being sold or was reselling it, and the returns made.\textsuperscript{14} At larger marketplaces a subset of vendors were surveyed with a tally recorded of those not included. In total 1,379 whole market vendor surveys were conducted. The surveys aimed to sample a large proportion of vendors present. The smaller the number of vendors in the market, the greater the proportion of vendors surveyed. The target percentage of vendors to sample was predetermined based on the size of the market and the number of enumerators available. At Kerevat and Alotau, for example, every third vendor was interviewed. At Kokopo every fourth vendor was interviewed. The smallest percentage of vendors surveyed was at Kokopo, where 28% of vendors present on the day were surveyed, but the actual number of vendors surveyed there was the highest of all the surveys.

Details of dates of data collection and vendor numbers are included in Tables 2.1 and 2.2.

\textsuperscript{14} The whole of market surveys were very similar to the market surveys undertaken for the *Roads in Gazelle Peninsula development: Impact of roads in the post-eruption economic landscape of East New Britain* report in 2009 (Scales 2010). There were minor differences in the research instruments. The 2015-16 survey recorded vendor attendance in the past 7 days, whereas the 2009 survey recorded attendance in the past 14 days. The 2015-16 survey recorded income earned on the vendors last selling day, whereas the 2009 survey recorded how much vendors usually earn. The 2015-16 survey disaggregated produce type, whereas the 2009 survey recorded produce categories. The 2015-16 also recorded whether vendors were producer-sellers or resellers.
### Table 2.1. Large marketplaces - Whole market and coconut vendor surveys

<table>
<thead>
<tr>
<th>Market location</th>
<th>Date of survey</th>
<th>Day of survey</th>
<th>Total no. vendors at market</th>
<th>No. vendors included in whole market survey</th>
<th>% of total vendors surveyed</th>
<th>No. coconut vendors surveyed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ENB</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kerevat (rural service centre)</td>
<td>3-Nov-15</td>
<td>Tuesday</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>26-Nov-15</td>
<td>Thursday</td>
<td>132</td>
<td>50</td>
<td>38%</td>
<td>5</td>
</tr>
<tr>
<td>Kokopo (urban)</td>
<td>7-Nov-15</td>
<td>Saturday</td>
<td>1399</td>
<td>389</td>
<td>28%</td>
<td>12</td>
</tr>
<tr>
<td>Rabaul (urban)</td>
<td>5-Nov-15</td>
<td>Thursday</td>
<td>650&lt;sup&gt;15&lt;/sup&gt;</td>
<td>339</td>
<td>c.50%</td>
<td>7</td>
</tr>
<tr>
<td>Warangoi Sawmill (rural service centre)</td>
<td>4-Nov-15</td>
<td>Wednesday</td>
<td>52</td>
<td>52</td>
<td>100%</td>
<td>1</td>
</tr>
<tr>
<td><strong>Milne Bay</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alotau (urban)</td>
<td>02-Sep-16</td>
<td>Friday</td>
<td></td>
<td></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>05-Sep-16</td>
<td>Monday</td>
<td>352</td>
<td>115</td>
<td>33%</td>
<td>11</td>
</tr>
<tr>
<td>Hagita Oil Palm Estate</td>
<td>01-Sep-16</td>
<td>Thursday</td>
<td>49</td>
<td>30</td>
<td>61%</td>
<td>9</td>
</tr>
<tr>
<td>Waigani Oil Palm Estate</td>
<td>01-Sep-16</td>
<td>Thursday</td>
<td>17</td>
<td>17</td>
<td>100%</td>
<td>5</td>
</tr>
<tr>
<td><strong>WNB</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kimbe (urban)</td>
<td>14-Nov-15</td>
<td>Saturday</td>
<td>555</td>
<td>222</td>
<td>40%</td>
<td>4</td>
</tr>
<tr>
<td>Bululuma (rural service centre)</td>
<td>13-Nov-15</td>
<td>Friday</td>
<td>106</td>
<td>53</td>
<td>50%</td>
<td>3</td>
</tr>
<tr>
<td>Poinini (rural)</td>
<td>15-Nov-15</td>
<td>Sunday</td>
<td>48</td>
<td>25</td>
<td>52%</td>
<td>2</td>
</tr>
</tbody>
</table>

### Table 2.2. Roadside marketplaces - Whole market and coconut vendor surveys<sup>16</sup>

<table>
<thead>
<tr>
<th>Market location</th>
<th>Date of survey</th>
<th>Day of survey</th>
<th>Total no. vendors at market</th>
<th>No. vendors included in whole market survey</th>
<th>No. coconut vendors surveyed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ENB</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bitavavar</td>
<td>3-Nov-15</td>
<td>Tuesday</td>
<td>4</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>6-Nov-15</td>
<td>Friday</td>
<td>4</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Malakuna #4</td>
<td>4-Nov-15</td>
<td>Wednesday</td>
<td>26</td>
<td>20</td>
<td>11</td>
</tr>
<tr>
<td>Laup</td>
<td>4-Nov-15</td>
<td>Wednesday</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>WNB</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Klin Wara</td>
<td>12-Nov-15</td>
<td>Thursday</td>
<td>9</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Kulungi</td>
<td>12-Nov-15</td>
<td>Thursday</td>
<td>16</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>Mai</td>
<td>13-Nov-15</td>
<td>Friday</td>
<td>42</td>
<td>42</td>
<td>14</td>
</tr>
</tbody>
</table>

<sup>15</sup> Average number of vendors attending the Rabaul Market accounting for those occupying multiple spaces. From East New Britain Provincial Market Authority data.

<sup>16</sup> A small roadside market at Boiou on Misima Island in Milne Bay Province was also surveyed but has been omitted due to the small size of the sample.
At some marketplaces it was difficult to count with complete accuracy the total number of vendors attending the market as vendors were arriving and leaving throughout the day. This was particularly evident at the Rabaul Market. In Rabaul 339 vendors were surveyed. However, as the number of vendors in the market grew rapidly in the late afternoon, time and resource limitations meant that only data on gender and produce type were collected from 148 of the vendors. They were mainly producer-sellers of root crops and betel nut. East New Britain Provincial Market Authority data indicates that an average of 738 vendor spaces were occupied each day at the Rabaul market (November 2014 - October 2015). Because some sellers occupy multiple vendor spaces the actual number of vendors is slightly lower. Some producers also quickly on-sell to resellers after paying the gate fee and were not available for inclusion in the whole market survey. The number of vendors surveyed by the research team was adequate to provide context to the dry coconut vendor data.

The surveys provided a single day snapshot of each market. Whilst the sampling technique for the whole of marketplace surveys was robust, the single day surveys are unable to capture differences across different days of the week, or throughout the year.

The size of the marketplaces in terms of the number of vendors and buyers varies, depending on the day of the week. In the large urban marketplaces, Friday and Saturdays usually attract a higher number of vendors. Some marketplaces, such as Poinini (WNB), operate only on Sunday when the main town marketplaces are closed. Each of the large marketplaces was surveyed on a day that the marketplace is known to be busy. Market size, and produce in the market, is also influenced by seasons. The surveys in ENB and WNB were conducted during the mango season.

The data on earnings asked vendors to self-report how much they had earned the last time they had sold at the market. It did not account for transport costs, market fees or other costs, though it is possible some vendors may have factored this in themselves. The exception was for vendors who had purchased produce to resell, in which case the purchase price of their produce was deducted. For most of the roadside markets there are no transport costs or market fees. Sometimes, individual self-reported income data can be unreliable. However, the large number of surveys conducted, and the relatively narrow range of reported incomes, gives confidence that they are a good indication of vendor earnings. The following chapter presents the results from surveys conducted at the large markets. Chapter 4 presents the roadside market results.
3. RESULTS - LARGE MARKETPLACES

The large marketplaces included in this study (Table 2.1) varied in size and character. The Kimbe, Kokopo, Rabaul and Alotau main markets are large urban marketplaces formally-managed by urban authorities or mandated market authorities. The ENB marketplaces at Kerevat (administered by a market authority) and Warangoi Sawmill (a privately run market) serve small rural service centres. The WNB marketplace at Buluma, and Hagita and Waigani in Milne Bay serve industry residential compounds. Poinini is a busy informal roadside marketplace, which operates on Sundays when other markets are closed. The markets are characterised by a mix of local and migrant sellers, and both resellers and producer-sellers. They are primarily fresh food marketplaces with a large variety of produce including staples, fruit and vegetables, cooked food, betel nut and tobacco. Most of the marketplaces also sell some crafts (string bags, shell money strings), second-hand clothes, and/or manufactured goods. This chapter presents the survey findings for each of the large marketplaces including vendor characteristics, produce information and market earnings. The chapter also discusses the characteristics and trading of dry coconut vendors at each of the marketplaces.

3.1. East New Britain

There are four large produce marketplaces on the Gazelle Peninsula at Kokopo, Rabaul, Kerevat and Warangoi Sawmill. In the most recent National Census in 2011, the main urban area Kokopo-Vunamami (Kokopo is the provincial capital) had a population of around 32,000 (NSO 2014). It has a large market with an average of around 1300 vendors present on weekdays, and almost 1700 vendors on Saturdays (Plate 3.1). The Rabaul market\textsuperscript{17} in the old capital is substantially smaller, though still a large market, with around 650 vendors, servicing an urban population of approximately 4800. The marketplaces in Kerevat and Warangoi Sawmill, being in much smaller rural centres, had 132 and 52 vendors respectively. In addition to the urban populations, the four marketplaces, particularly Kokopo and Rabaul, also serve the much larger rural population of the north-east of the Gazelle Peninsula. In 2011, around 262,000 people lived in the north-east Gazelle (NSO 2014).\textsuperscript{18} The north-east Gazelle Peninsula is one of the most developed areas of the country. It has an extensive road network, and vendors are drawn to the marketplaces from villages in the north-east of the Peninsula and surrounding islands (also see Scales 2010).\textsuperscript{19}

\textsuperscript{17} The Gazelle Peninsula has a long history of marketplaces. A network of marketplaces operated in the area in the pre-colonial period, and the country’s first modern marketplace was established in Rabaul in the 1920s (see Epstein 1982; Salisbury 1970).
\textsuperscript{18} The population of the north-east Gazelle here includes the populations of Rabaul District, Kokopo District and Central Gazelle Rural LLG, Livuan/Reimber Rural LLG, Vunadidir/Toma Rural LLG, and Inland Baining Rural LLG (Gazelle District) and Sinivit Rural LLG (Pomio District).
\textsuperscript{19} Spatial analysis of the vendor residence data was not completed for this report. See Scales (2010:26) for the vendor catchment data for Kokopo in 2009. Scales (2010:27) reported that the great bulk of vendors came from within 18 km of the market, after which point transport costs discouraged market attendance.
More than 95% of vendors in the large ENB marketplaces were women. The majority of vendors were selling produce they or their family produced. At Kokopo market, only 10% of fresh food vendors were reselling produce, though this level of reselling is a significant development, given that prior to the 2000s there was only very limited intermediary trading in PNG’s fresh food marketplaces (see Sharp 2021). In contrast, 37% of betel nut vendors were reselling. The majority of vendors had marketed on just one day out of the past seven (Figure 3.1) and the average number of marketing days per vendor was 2.5. Resellers sold more frequently than producers – 53% of those who were reselling produce reported to have sold 5-7 days in the previous week. By contrast 88% of producer-sellers sold 1-3 days in the previous week. Coconut vendors were more likely to market only one or two days per week. Although buyer data were not collected in the surveys, conversation with market goers and responses from vendors selling coconuts indicated buyers at Rabaul Market and Kokopo Market were mostly town residents. At Rabaul, people moving back into the areas impacted by the 1994 volcanic eruption were also important buyers of coconuts. Buyers at the Warangoi Sawmill market were a mix of settlers and customary landowners from the Baining area. At Kerevat customers were both settlers and customary landowners resident in the Baining area to the south, and settlers on land settlement scheme blocks at Tavilo and Vudal, oil palm workers and workers from surrounding educational institutions21, the Kerevat Correctional Institute, PNG Forest Authority, the National Agricultural Research Institute and CCIL.


20 Scales (2010) reports 96% of vendors at the major Gazelle markets were women.
21 Kerevat National High School, Kerevat Primary School, George Brown Theological and Pastors Colleges, and the University of Natural Resources and Environment.
Figure 3.1. Frequency of vendor market participation in the previous seven days, includes day of survey, Kokopo Market, 2015.

The most common items being sold across all marketplaces were fruits, vegetables and stimulants (mainly betel nut) (Figure 3.2). Coconuts were a relatively minor item, and the volume of coconuts being sold was also small. At Kerevat only 8% of vendors were selling dry coconuts, and less than 5% were selling them at the other three market locations.

Figure 3.2. Percent of vendors selling each product type, ENB.

Of the 72% of vendors that specified, mean returns made on their last day selling in the market were greatest at Kokopo and Rabaul marketplaces. These vendors earned on average
K79 and K72 respectively (Figure 3.3). Those at Kerevat on average returned K54 and at Warangoi K39. This suggests potential market earnings are higher in the larger marketplaces, where more customers are present (see Figure 3.4). Indeed, earnings in large marketplaces were higher than in the small roadside marketplaces (Chapter 4), although costs associated with selling were higher in large marketplaces.

![Figure 3.3. Mean returns made by vendors on their last market day.](image)

Average daily returns for vendors may also vary depending on the produce sold. Kokopo market is divided into different produce sections, allowing average returns per vendor to be calculated based on the market section in which they were located. Mean returns per vendor for the main types of products being sold ranged from K69 for fruits and vegetables to K99 for tobacco (Figure 3.5).

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22 These figures are gross earnings. Travel costs, market fees and other expenses were not deducted, however, for resellers the purchase price of their produce was deducted.

23 In 2010 Scales reported that across the major Gazelle markets “About two-thirds of urban market vendors reported that they typically earned between K20 and K70 in a day at the market” (2010:25).

24 For this calculation it has been assumed that vendors sold the same category of produce on their last market visit. This is a reasonable assumption, although for a substantial number this may not have been the case.
Figure 3.4. The relationship between market size (vendor numbers) and vendor earnings (mean of reported returns in kina on vendors last market day) in ENB, 2015. Shown with logarithmic trend line.

Figure 3.5. Mean returns per vendor for last market visit by market section, Kokopo.\textsuperscript{25}

\textsuperscript{25} For this graph product categories are based on the section of the Kokopo Market where the produce is sold.
Dry coconut vendors

All 23 dry coconut vendors at the large ENB marketplaces were women from local villages. Most resided in the Local Level Government (LLG) area in which the market was located, with the exception of some coconut vendors at Kokopo market who resided more widely across the Gazelle (Bitapaka and Central Gazelle LLGs). All were selling their own coconuts while a small number were also selling coconuts for someone else. None of the vendors was a reseller. Eighty-five per cent of the vendors were selling nuts from coconut palms more than 20 years old and for almost 50% they were over 40 years. For most, the coconuts were transported to the market by vehicle, with a small number walking and carrying their coconuts.

Vendors chose to sell at the large marketplaces because they receive better prices for their coconuts, and the other produce they were selling. Demand is also higher as there are more customers, and most are town people who earn a regular income. In most rural areas on the Gazelle it is difficult to sell coconuts as most people have their own coconut palms. In general, demand for dry coconuts was highest at times of celebration such as Christmas, Easter, Independence Day or other special events.

Almost 70% of vendors had sold coconuts once or twice in the seven days prior to the survey. Some sell coconuts only when they require ‘fast cash’ or sell a small quantity to pay for their transport into town for shopping or to access other services.

For a period, vendors at Kerevat market were observing a roster system for selling dry coconuts. The roster restricted the sale of coconuts each day to producer-sellers from particular designated areas. The aim of the roster was to reduce the number of coconut vendors on any one day as there had been an oversupply of coconuts on some days making marketing difficult and prices uneconomical. The roster was formulated by the market authority in response to a request from villagers from the Napapar and North Coast areas. The roster was not operating at Kerevat at the time of surveys in November 2015.26

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26 See Sharp (2019:195) for a similar timetable/roster established in the betel nut trade.
In the large urban marketplaces, the sale of dry coconuts is merely part of a wider suite of fresh food selling, and no more significant than any other fresh food item. Most vendors selling coconuts at Kokopo and Rabaul markets carried only a small number of coconuts to the market (Figure 3.6). Whilst dry coconut was the item of the greatest quantity for the four vendors selling coconuts at Kerevat and Warangoi Sawmill, at Kokopo and Rabaul markets other items besides coconuts were in the greatest quantity for most coconut vendors. Many of the vendors selling dry coconuts were selling a wide range of products, mostly fresh produce: one vendor at Kokopo was selling nine different items. At the Warangoi Sawmill market, only one vendor was selling coconuts, although at 80 coconuts they had brought more coconuts to market than any other vendor surveyed in the larger marketplaces. This vendor was responding to the demand for coconuts amongst people residing to the south of Warangoi Sawmill (see Section 4.1).
The price of coconuts differed between marketplaces. Vendors at Kokopo and Kerevat received around K0.60 per nut in contrast to those at Rabaul and Warangoi who received approximately half this amount (Table 3.1). Vendors may gradually decrease prices throughout the day to ensure there is no produce remaining.

<table>
<thead>
<tr>
<th>Market</th>
<th>Price per dry coconut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kerevat</td>
<td>K0.60</td>
</tr>
<tr>
<td>Kokopo</td>
<td>K0.58</td>
</tr>
<tr>
<td>Rabaul</td>
<td>K0.34</td>
</tr>
<tr>
<td>Warangoi</td>
<td>K0.25</td>
</tr>
</tbody>
</table>

Based on vendors’ net income per market visit, the mean income earned per vendor from selling coconuts was low (K23 at Kerevat; K9 at Kokopo and K5 at Rabaul). Nevertheless, the majority of vendors considered the sale of dry coconuts to be a good source of income primarily because very little labour is required in producing and harvesting nuts compared to other food crops. Although around two-thirds of vendors had recently sold copra,\textsuperscript{27} many preferred to sell dry coconuts because it was much less labour intensive (Section 5.3).

\textsuperscript{27} In ENB in November 2015 the copra price was increasing to a level where growers considered it worth producing copra.
Two-thirds of vendors had cocoa holdings, with 80% of these impacted by CPB. For many the sale of dry coconuts was an alternative means of accessing income to support their livelihoods. While many were already selling dry coconuts prior to the arrival of CPB, around half said they were now selling more coconuts due to the impact of CPB. Many coconut vendors also sold other coconut products such as green coconuts (kulau) for drinking, brooms, baskets and mats.

The sale of coconuts was the primary source of income for only two vendors (Table 3.2). However, the majority of vendors identified coconut sales in the top three sources of income. Garden food was the most common primary income source for more than half of the vendors at Kokopo and Rabaul. Although around two-thirds of the coconut vendors at Keravat, Kokopo and Rabaul had cocoa holdings, none considered it a primary income source.

Table 3.2. Primary source of income for coconut vendors in large markets, ENB.

<table>
<thead>
<tr>
<th>Primary Income Source</th>
<th>Number of coconut vendors (n=23)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garden food</td>
<td>13</td>
</tr>
<tr>
<td>Cooked/ prepared foods</td>
<td>1</td>
</tr>
<tr>
<td>Coconuts – dry or green</td>
<td>2</td>
</tr>
<tr>
<td>Copra</td>
<td>6</td>
</tr>
<tr>
<td>Betel nut</td>
<td>1</td>
</tr>
<tr>
<td>Cocoa</td>
<td>0</td>
</tr>
</tbody>
</table>
3.2. West New Britain

Surveys were undertaken in three large marketplaces in the Kimbe/Hoskins area: Kimbe Market in the centre of Kimbe town (Plate 3.3), Buluma market approximately 20 km east of Kimbe, and Poinini (Sunday only) market located approximately 10 km east of Kimbe. Kimbe and Buluma markets operate 6 days a week. In the most recent census, the population of the Kimbe Urban LLG was almost 23,000 (NSO 2014). Kimbe also services the surrounding LLGs where oil palm production is the dominant industry. Due to time limitations, marketplaces in the Bialla area and other large marketplaces in the oil palm growing areas of Kimbe Bay were not surveyed.

Over 550 vendors were selling goods at the Kimbe main market (Table 2.1). At Kimbe Market, in addition to the main market area where mainly fresh food was sold, there were also separate adjoining betel nut and second-hand goods sections. Both Buluma and Poinini markets are large district marketplaces located on the main road between Kimbe and Hoskins. At Buluma, on the day of the survey, 106 vendors were present. Poinini market is about half the size of the Buluma market and almost 50 vendors were present on the day surveys were conducted. Like most marketplaces, the majority of vendors at all three marketplaces were women – 86% at Kimbe, 94% at Buluma, and 96% at Poinini.


The majority of fresh food vendors in the large WNB marketplaces surveyed were the producers of the produce they were selling. At Kimbe market, producers made up 86% of fresh food vendors. However, that 14% of fresh food vendors were reselling produce is a significant development, given that, again, prior to the 2000s there was only very limited
intermediary trading in PNG’s fresh food marketplaces (Sharp 2021). By contrast, most (70%) betel nut vendors at Kimbe market were reselling.

The vendors at each market came from various residence types (Figure 3.8), and from different ethnic backgrounds. There was a large ethnic diversity at Kimbe market, with 83% of vendors of migrant origin. At Buluma, just over 40% of vendors were from cultural groups within WNB with the remainder belonging to cultural groups outside of WNB. The majority at Poinini were of East Sepik origin, mostly from the nearby smallholder oil palm blocks in Gaungo and Mandopa CRPs, Kapore and Kavui LSS, and residents from Bebere divisions 1 and 2 NBPOI plantation compounds.

At Kimbe market 17% of vendors were residing on their own customary land (including those from VOP blocks), 27% were from the oil palm Land Settlement Schemes (LSS), and 45% residing in urban informal settlements (Figure 3.8). The proportion of vendors at Kimbe market from urban informal settlements has increased significantly over time. In 2000, 19% of vendors lived in town and by 2008, this had increased to 30% (Ryan 2009; Koczberski et al. 2012) (Table 3.3). The increasing proportion of urban resident vendors at Kimbe Market likely reflects the rise of reselling in the marketplace – in 2015, 78% of fresh food and betel nut vendors who were reselling lived in informal settlements, and 66% of the fresh food and betel nut vendors (and 75% of all vendors) who were living in the settlements were resellers. The increased sale of manufactured goods and second-hand clothes in Kimbe Market also helps explain the growing proportion of urban resident vendors there.

Figure 3.8. Residence type of market vendors.

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28 In the late 1970s, 53% of vendors at Kimbe market were migrants from elsewhere in PNG (Benjamin 1985).
Over the same period, the proportion of vendors resident on LSS blocks has declined, from 44% in 2000, to 37% in 2008, and to 27% in 2015 (Table 3.3).\(^{29}\) It is not clear whether this is simply due to the growing number of urban resident vendors, or due to declining LSS participation at the Kimbe market. It is likely both are contributing factors. If, indeed, LSS participation has declined over the period, this is likely in part due to a general increase in oil palm prices since 2000 (see Figure 1.8). In 2000, oil palm prices were very low, and this may have led to high participation of LSS households in local markets at the time. In 2008 oil palm prices were strong, and around twice the price prevailing in 2015 (see Figure 1.8). Although prices were low in 2015, a decline in LSS participation at Kimbe Market may reflect a longer-term trend. Further, despite low oil palm prices in 2015, vendors from the LSS may not have been in higher numbers at the market due to declining access to gardening land on the oil palm blocks (see Koczberski et al., 2018). There are also reports that urban resident resellers are squeezing producers out, as occurs in other marketplaces in PNG (Sharp 2021), though this will only be part of the explanation as the proportion of vendors from LSS appears to have declined more than has the proportion of village resident vendors.

Table 3.3. Residence of vendors at Kimbe market (including main betel nut market) in 2000, 2006 and 2015.

<table>
<thead>
<tr>
<th>Year</th>
<th>Urban</th>
<th>Village (including VOP)</th>
<th>LSS</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000 (n=108)</td>
<td>19%</td>
<td>16%</td>
<td>44%</td>
<td>21%</td>
</tr>
<tr>
<td>2008 (n=89)</td>
<td>30%</td>
<td>22%</td>
<td>37%</td>
<td>11%</td>
</tr>
<tr>
<td>2015 (n=218)</td>
<td>45%</td>
<td>17%</td>
<td>27%</td>
<td>11%</td>
</tr>
</tbody>
</table>

Sources: Koczberski et al. 2001; Ryan 2009; Koczberski et al. 2012; present study

Although LSS residents comprise a declining proportion of vendors at Kimbe market, households from LSS blocks continue to have a strong involvement in food marketing. Surveys undertaken in 2014, as part of the larger food security project, found that in the Hoskins (Kimbe) area 46% of LSS households had marketed fresh food in the past seven days. Thirty-two per cent of each VOP and CRP households had done the same. Although LSS smallholders continue to have strong involvement in marketplaces, their trading appears to be shifting

\(^{29}\) In 2000, fresh food and betel nut were both sold in the main market, however in 2008, betel nut sales occurred in a separate market to fresh food. In 2015 the betel nut was again part of the main market, in an adjoining section. To improve comparability of the data, for 2008, data from the separate fresh food and betel nut markets were combined.
away from Kimbe town market to rural marketplaces on the LSS or at nearby roadside marketplaces, which have become more prominent in recent years (see Chapter 4).

The most common group of products being sold at Buluma and Kimbe markets were stimulants; mainly betel nut and betel pepper (Figure 3.9). Store goods were a common item for sale at Kimbe. The sale of store goods is increasingly common in PNG’s marketplaces (although some markets ban the sale of these items). Vendors at Poinini market were mostly selling greens and vegetables. Coconut products were being sold by around 25% vendors at Poinini and less than 10% at Buluma and Kimbe. Vendors at Kimbe and Buluma were more specialised in the range of produce they sold compared to vendors at Poinini who sold a more diverse range of produce. The mean number of products sold by vendors at Kimbe market was 1.9, at Buluma 2.3, and at Poinini market 3.2.

![Figure 3.9. Products being sold by vendors.](image)

Vendors at Kimbe had marketed on average for four days out of the past seven, Buluma two days and Poinini one and a half days. The frequency of selling at Kimbe (Figure 3.10) reflects the high number of vendors who are reselling goods in the market. Dry coconut vendors sold on fewer days than the average.
Figure 3.10. Frequency of vendor market participation in the previous 7 days (including day of survey), Kimbe Market, 2015. *excludes vendors in second-hand clothes and store goods sections of the market.

Mean returns made from the last day marketing were highest at Buluma and Kimbe at just over K100 although the median at Buluma was K40 (Figure 3.11). Some very high returns at both marketplaces had been made by those selling cigarettes, betel nut and store goods. Vendors at Poinini averaged returns of K65.

Figure 3.11. Mean returns made last time vendors marketed.

At Kimbe, market vendors occupy different sections of the marketplace based on the items they are selling. When calculating returns received last time based on the market section in which vendors were located, the highest average return of K200 was from second-hand goods and the lowest of around K70 was from selling fresh foods (Figure 3.12).
Coconut vendors

Nine dry coconut vendors were interviewed. All were women, the majority of whom were from oil palm smallholder households. Vendors belonged to cultural groups from WNB, ENB and East Sepik. All vendors were selling their own coconuts which had been harvested from trees more than 20 years old. Vendors transported their coconuts to market by vehicle with the exception of one vendor at Buluma who used a wheelbarrow as she resided close to the market.

Coconut vendors claimed that the demand for coconuts was good. Demand at Poinini was sufficiently high to enable vendors to sell all of their coconuts. As the Poinini market only operated on Sundays vendors also sold coconuts at other nearby marketplaces during the week. On average coconut vendors marketed 1 to 2 days per week. The most popular days were Wednesday, Friday and Saturday when customer numbers were greatest. The number of dry coconuts taken to market by vendors was highest at Buluma where on average vendors took 55 nuts (Figure 3.13). Vendors at Kimbe and Poinini took just under 40 nuts to market. Almost all vendors husked the nuts prior to taking them to market.

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Previous research reported sales were higher in the days following the fortnightly private sector and the oil palm smallholder pay days, and more so than following the public sector pay day (PNGOPRA 2014:4-8).
The selling price of coconuts depends on the size of the nut. Vendors at Buluma were selling for an average price per nut of K0.44 (Table 3.4).

Table 3.4. Average prices received per dry coconut.

<table>
<thead>
<tr>
<th>Market</th>
<th>Price per dry coconut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buluma</td>
<td>K0.44</td>
</tr>
<tr>
<td>Kimbe</td>
<td>K0.39</td>
</tr>
<tr>
<td>Poinini</td>
<td>K0.32</td>
</tr>
</tbody>
</table>

Only one of the nine coconut vendors ranked the selling of dry coconuts as their primary source of income. Oil palm was the primary income source for the majority of vendors. For many, selling dry coconuts was a convenient supplementary income. As in ENB and Milne Bay, vendors like to sell coconuts as they are easy to prepare for market and are a fast way of earning cash for the household; there is no need to wait until pay day. The six vendors who had cocoa intercropped with their coconuts, and had been impacted by CPB, said they were selling more coconuts now as a result.

All vendors were selling other items in addition to dry coconuts (Plate 3.4). Items included bananas, drinking coconuts, mangoes (which were in season during the surveys) and other fruits, and garden produce. All vendors indicated that their food gardens had been impacted by the El Nino induced dry weather conditions that were occurring at the time of the surveys and as a consequence cash earnings had declined. However, just two of the nine vendors reported to be selling more coconuts to compensate for this reduction in income.
3.3. Milne Bay

Three large marketplaces were surveyed on the mainland area of Milne Bay Province: the main market in Alotau, the provincial capital, and Hagita and Waigani Oil Palm Estate Markets. Alotau market services a population of around 12,000 in the Alotau urban LLG (NSO 2013), as well as surrounding LLGs. At Alotau market, on the day of the survey there were 352 vendors present. Vendors came from surrounding villages and islands and the local oil palm estates of Hagita, Waigani and Sagarai. Hagita and Waigani markets are basic corrugated iron roofed shelters constructed by the oil palm company. They are located on oil palm estate worker compounds and service the employees as well as smallholders from surrounding VOP blocks and nearby villages. These two estates are located within the Huhu Rural LLG. Hagita and Waigani markets are much smaller than Alotau market, with a total of 58 and 22 vendors respectively. Just over 80% of vendors at Alotau were women, 90% were women at Hagita and 55% at Waigani.31

The most common products being sold at all three marketplaces were stimulants: betel nut, betel pepper, powdered lime and tobacco. Sixty-five per cent of vendors sold stimulants at Waigani and 43% at Alotau and Hagita (Figure 3.14). Cooked foods were being sold by 27% of vendors at Hagita. Dry coconuts were sold by almost a quarter of vendors at Waigani, though only by a relatively small proportion of vendors at Alotau (4%) and Hagita (7%).

31 The high proportion of male vendors at Waigani is associated with the high proportion of vendors selling betel nut in the market. It is more common for men to sell betel nut than garden foods.
Figure 3.14. Percent of vendors selling each product type (Alotau n=115; Hagita n=30; Waigani n=17).

The mean number of days out of seven spent marketing was approximately two for vendors at Alotau and Waigani and almost three at Hagita. Of the 52% of vendors who specified returns made last time they had marketed, the mean was highest at Alotau at K96 (Figure 3.15). Vendors at the oil palm estate marketplaces had lower returns of K68 and K30 respectively.

Figure 3.15. Mean returns made by vendors on their last market day.

Based on the product of the highest quantity being sold by vendors at Alotau, the highest mean return was for those selling stimulants, most of which was betel nut (Figure 3.16). The least returns were made from coconuts, cooked foods, leafy green vegetables and nuts.
Almost all of the 47 coconut vendors surveyed at large marketplaces in Milne Bay were from local villages. The 14 coconut vendors at Hagita and Waigani Estates were from Huhu Rural LLG, the LLG in which the oil palm estates are located. At the Alotau market, almost 80% of the 33 coconut vendors surveyed over two days were also from Huhu Rural and the remainder were from Maramatana, an adjacent LLG. All coconut vendors at Alotau were women, and only one male vendor was recorded at each of the marketplaces at Hagita and Waigani. Approximately one third of vendors sold at other marketplaces for reasons such as proximity to home and to take advantage of the pay cycles of oil palm estates and the local private and government sectors. Most did not have set days for marketing dry coconuts but many were influenced by customer demand which was highest on pay days. Coconut vendors tended to market slightly below the mean number of days for all vendors, and some vendors only sold dry coconuts when they required immediate cash for the household.

Coconuts being sold were sourced from the vendors own coconut palms with the exception of two vendors at Hagita who had purchased them to resell. Of the 45 vendors that brought their own coconuts three had the intention to sell them on to resellers. More than 75% of the palms from which the coconuts were sourced were over 40 years old. The task of getting the coconuts to market involved transport by vehicle for 70% of vendors with approximately half of these also walking to transport their coconuts. Five vendors at Alotau brought them by boat. Most vendors at Waigani carried or wheelbarrowed their coconuts as they lived within close walking distance of the market (Plate 3.5).
Despite coconut vendors reporting high demand for coconuts at their respective marketplaces, the number of coconuts brought by vendors to the marketplaces was low. Of those who specified, on average vendors had brought about 25 nuts to Alotau and Hagita, and 17 to Waigani (Figure 3.17).

Vendors received a reasonable price for their coconuts. Average prices received per nut at the three marketplaces were similar, although those at Alotau market were slightly higher than the oil palm estate marketplaces (Table 3.5).
Table 3.5. Average prices received per dry coconut

<table>
<thead>
<tr>
<th>Market</th>
<th>Price per dry coconut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alotau</td>
<td>K0.47</td>
</tr>
<tr>
<td>Hagita</td>
<td>K0.41</td>
</tr>
<tr>
<td>Waigani</td>
<td>K0.42</td>
</tr>
</tbody>
</table>

The average reported typical earnings by vendors per market visit from coconut sales ranged from K3 to K45. The median of reported average incomes was around K15 at both Alotau and Hagita, and K8 at Waigini. Transport costs were minimal for vendors at Hagita and Waigani and market fees were not charged, unlike at Alotau market. Transport costs were much higher at Alotau. Dry coconuts were the primary source of income for just one of the coconut vendors at Alotau and two at Hagita (Table 3.6). Garden food was the most common primary income source at Alotau and Hagita. Oil palm was the primary income source for three of the five vendors at Waigani.

Table 3.6. Vendor’s primary income source, Alotau, Hagita and Waigani markets.

<table>
<thead>
<tr>
<th>Product Group</th>
<th>Alotau (n=32)</th>
<th>Hagita (n=9)</th>
<th>Waigani (n=5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garden food</td>
<td>19</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Fish/shells</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooked/prepared foods</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Dry coconuts</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Copra</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil palm</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Betel nut</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Although dry coconuts were not a primary income source for many vendors they were in the top three sources of income for 20% of the coconut vendors at Alotau and Waigani and 33% at Hagita. Over 80% of dry coconut vendors considered this enterprise to be a good way to earn money. The reasons given were that demand for coconuts was high, coconuts were easy to access and prepare for market, and that coconut sales were a simpler and faster way to make money compared to copra and garden food.

Coconut sales provide a good supplementary income for many vendors whose primary source of income is garden food or oil palm. The majority of vendors at times also earned income from selling other coconut palm products at the market such as drinking coconuts, brooms.
and/or baskets. More than 80% of dry coconut vendors were selling other items in addition to coconuts with the average number of items for sale being three. For coconut vendors, dry coconuts was the item of the greatest quantity for one third of vendors at both Alotau and Hagita markets, though none at Waigani. At the time the surveys were conducted, Milne Bay had been impacted by drought. In 2016, drought conditions had eased throughout much of PNG, but were intensifying in Milne Bay. This was affecting the food gardens of half of the vendors at Alotau market. Although most continued to sell the same quantity of coconuts some were selling more to earn additional cash income to buy food.

Two thirds of the coconut vendors were from households that sold copra and 70% of these households had sold it in the few months prior to the survey. Most women preferred to sell dry coconuts in preference to copra particularly when prices for copra were low.

### 3.4. Large marketplaces – summary and discussion

A large number of vendors, mostly women, gather at the large urban, district and oil palm estate marketplaces. Vendors at the marketplaces sell a wide diversity of fresh food, in addition to cooked food, stimulants, ‘store goods’, and handicrafts. The proportion of goods falling into each of these categories differs markedly between marketplaces. Average daily returns made by vendors at the large urban marketplaces at Kokopo, Alotau and Kimbe were between K80 and K100. At the district and oil palm estate marketplaces returns were in the vicinity of K30 to K70.

A summary of the main survey findings among dry coconut vendors at the large markets is presented in Table 3.7. Only a small proportion of vendors at the large marketplaces sold dry coconuts, and most vendors selling dry coconuts also sold other items. For a small number of vendors, coconuts were the main item being sold. At Kerevat (ENB), Kimbe and Buluma (WNB), there was some specialisation in dry coconut selling evident, with vendors carrying a large number of coconuts to the marketplace. However, for most vendors coconuts were no more important than any of the other fresh food items being sold. Selling dry coconuts was the primary source of income for less than 10% of coconut vendors in the large markets. The sale of dry coconuts typically generated only small incomes, although many women valued the supplementary income they provided. Despite the low earnings from dry coconut sales, women viewed it as ‘easy money’ because production requires minimal labour and demand is high, especially at the large marketplaces. Yet, coconuts are bulky, and have a low value to weight ratio. This, together with the costs of transport and market fees were often deterrants to selling at the large marketplaces, particularly amongst people living longer distances from the marketplaces. However, many vendors like to sell in the large marketplaces as prices are higher than in smaller marketplaces.

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Table 3.7. Summary of dry coconut vendors at large markets

<table>
<thead>
<tr>
<th></th>
<th>East New Britain</th>
<th>West New Britain</th>
<th>Milne Bay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent of female vendors</td>
<td>100%</td>
<td>100%</td>
<td>96%</td>
</tr>
<tr>
<td>Mean daily market income earned (last visit)</td>
<td>K14</td>
<td>K52</td>
<td>K20</td>
</tr>
<tr>
<td>Percent selling other items</td>
<td>96%</td>
<td>100%</td>
<td>81%</td>
</tr>
<tr>
<td>Primary source of income</td>
<td>Garden food (57% vendors)</td>
<td>Oil Palm (67% vendors)</td>
<td>Garden food (54% vendors)</td>
</tr>
<tr>
<td>Dry coconut marketing ranked in vendor’s top three income sources</td>
<td>78%</td>
<td>78%</td>
<td>22%</td>
</tr>
<tr>
<td>Frequency of vendor participation per week (mean)</td>
<td>2.7 days</td>
<td>1.4 days</td>
<td>1.6 days</td>
</tr>
<tr>
<td>Percent whose households produced copra</td>
<td>61%</td>
<td>22%</td>
<td>70%</td>
</tr>
<tr>
<td>Percent of family coconut holdings over 40 years old</td>
<td>59%</td>
<td>56%</td>
<td>78%</td>
</tr>
</tbody>
</table>

In ENB, WNB and in Milne Bay the dry coconut trade in the main urban marketplaces and other large marketplaces is small in scale. Large-scale trading of coconuts is evident in the urban marketplaces in the Highlands region, with Highland-based traders transporting truck-loads of coconuts from the lowlands, but further research is needed to understand this trade. The findings in this chapter indicate that there is little evidence of growth of dry coconut marketing in the urban marketplaces in ENB, WNB and Milne Bay, but as outlined in the following chapter, the trade has developed at particular small rural roadside marketplaces.
4. RESULTS - ROADSIDE MARKETPLACES

Across PNG, the number of small marketplaces is expanding in both rural and urban areas. The small marketplaces in ENB and WNB included in this study were rural village-based roadside marketplaces (Plate 4.1). They were purposefully selected because of the large number of vendors selling dry coconuts at these locations. These marketplaces were identified by observations from local PNG researchers in combination with a rapid scoping trip of roadside marketplaces in November 2015. Vendors in these marketplaces, like other roadside vendors, sold a variety of produce, however the surveyed marketplaces are not representative of roadside marketplaces in the respective provinces. Most of the vendors were from local customary landowning groups, unlike the larger town marketplaces that featured many migrant vendors. The customers that patronised these marketplaces included other villagers, and those travelling to and from the larger town centres and employees of local industries. Coconut sales were focused on passing travellers. This chapter gives an overview of the marketplaces and discusses the characteristics and trading of dry coconut vendors at each.


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33 A small roadside market at Boiou on Misima Island in Milne Bay Province was also surveyed but has been omitted due to the small size of the sample (n=4).
4.1. East New Britain

In ENB, roadside marketing expanded significantly after the incursion of CPB as people searched for alternative sources of income. Surveys were conducted at three village marketplaces in ENB, at Bitavavar, Malakuna #4 and Laup, all located along the main road between Kokopo and Warangoi.

The Bitavavar Ward market is a small roadside market built of concrete, steel and corrugated iron, located a short distance from Kokopo (Plate 4.2). The market, like numerous other roadside marketplaces in Kokopo District, were funded by the Kokopo District Development Authority. The market primarily sells dry coconuts. This market was surveyed on two separate occasions, with four different vendors present on each day.

![Plate 4.2. Bitavavar Market, 2015.](image)

The Malakuna Ward Market is located midway between Kokopo and Warangoi. The market is comprised of a newer concrete, steel, and corrugated iron structure, funded by the Kokopo District Development Authority, and a similarly sized older concrete, wood and corrugated iron open structure (Plate 4.3). Vendors sold a range of items, of which betel nut and dry or green coconuts were most plentiful. A few vendors sold cooked foods, fruit and vegetables. Of the 20 vendors, 11 were selling dry coconuts.

A small *haus market* (house-front stall) at Laup, a short distance from Warangoi, was also surveyed. This *haus market* belonged to a single family. The vendor was a reseller selling only dry coconuts sourced from kin and another villager. The vendor also purchased coconuts from Malakuna #4.
The three marketplaces are oriented towards passing PMV passengers (Plate 4.4). Most sales are made in the afternoon when people are returning home from town. The main customers reportedly come from the new settlement belt area in the upper Warangoi Valley to the south and east of Warangoi, and the Baining foothills. The population in this area, which is rapidly expanding, is substantially from the formal resettlement program following the 1994 Rabaul eruption, when large numbers of people were displaced from Rabaul and areas surrounding the township. The area has also attracted strong informal migration in response to population pressures on the Gazelle (see Scales 2010:18). Demand for coconuts in this area is high because many people do not have established coconut palms due to their recent settlement, and the rhinoceros beetle – which is prevalent due to the presence of rotting logs in recently cleared areas – has made it difficult to establish new palms.\(^{34}\) Coconut palm growth is also poorer in the higher elevations of the Baining settlement area. Settlers in the area with only temporary or insecure access rights are also discouraged by landowners from planting permanent crops, or are not permitted to plant permanent crops.

Of the eight vendors surveyed at the Bitavavar coconut market six were women. All but one were customary landowners. At Malakuna #4, 18 of the 20 vendors interviewed were women and all but one were customary landowners. Last time vendors had marketed, the median profit earned was K21 at Bitavavar and K23 at Malakuna #4.

\(^{34}\) Rhinoceros beetles also breed in the roots of Gliricidia trees, a common shade crop for cocoa.
Coconut vendors were all selling their own coconuts which they had harvested from palms mostly more than 20 years old. Being village marketplaces, the vendors lived close by and could therefore carry their coconuts by hand or transport them in a wheelbarrow. This saved on transport costs compared to those transporting dry coconuts to the large urban marketplaces in the province. This was the main reason these vendors preferred the small local marketplaces. Low market fees were also attractive to vendors. At Bitavavar there were no market fees (and Laup was a house-front stall). Vendors at Malakuna #4 paid a K1 market fee to the Ward for maintenance of the market infrastructure and surrounds. Demand was also high from road travellers, most likely because coconut prices were substantially lower than in the town marketplaces: on average, K0.26 per coconut at Malakuna #4 compared to K0.58 at Kokopo. The limited costs associated with roadside selling enabled vendors to sell at a more competitive price.

On average vendors had marketed their dry coconuts on three days out of the past seven; some had marketed for six or seven days. Although many of the vendors marketed frequently, often only a few hours was devoted to this on each selling day. This contrasts with selling in the major urban marketplaces where vendors often devoted the whole day to selling. None of the vendors travelled to other locations to sell coconuts.

The number of coconuts brought to the marketplaces varied among vendors at each site (Figure 4.1). Most vendors brought less than 60, though some brought much larger numbers that were sold over multiple days, with the nuts stored near to the market rather than displayed in the market itself. One advantage of dry coconut selling is that the coconuts do not perish as quickly as many other marketed fresh foods. About one third of vendors had
husked the nuts prior to bringing them to market, although not those selling the very large quantities.

Selling price per nut varied depending on the size. The average price ranged from K0.18 per nut at Bitavavar to K0.26 at Malakuna #4 (Table 4.1). Larger coconuts at Malakuna #4 were sold for K0.50 each.

<table>
<thead>
<tr>
<th>Market</th>
<th>No. vendors (n)</th>
<th>Price per dry coconut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bitavavar</td>
<td>8</td>
<td>K0.18</td>
</tr>
<tr>
<td>Laup</td>
<td>1</td>
<td>K0.25</td>
</tr>
<tr>
<td>Malakuna #4</td>
<td>11</td>
<td>K0.26</td>
</tr>
</tbody>
</table>

The median of average income earned from the sale of dry coconuts was around K12 at Bitavavar and Malakuna #4 (Figure 4.2); the reseller at Laup reported to earn around K50 each day.
For the reseller at Laup and the majority of vendors at the other two marketplaces, dry coconuts were their main source of income (Table 4.2). For others it was garden produce, fruits, betel nut or cooked foods. Other items that were important income sources but not the main source included peanuts and the sale of store goods.

Table 4.2. Vendors’ primary sources of income, Bitavavar, Malakuna #4 and Laup.

<table>
<thead>
<tr>
<th>Income source</th>
<th>Number of coconut vendors (n=19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry coconuts</td>
<td>10</td>
</tr>
<tr>
<td>Copra</td>
<td>2</td>
</tr>
<tr>
<td>Betel nut</td>
<td>2</td>
</tr>
<tr>
<td>Kulau</td>
<td>1</td>
</tr>
<tr>
<td>Banana</td>
<td>1</td>
</tr>
<tr>
<td>Mango</td>
<td>1</td>
</tr>
<tr>
<td>Cooked food</td>
<td>2</td>
</tr>
</tbody>
</table>

Two thirds of the dry coconut vendors sold copra. Vendors indicated that copra sales were dependent on copra prices and the availability of coconuts. When coconuts are plentiful and the copra price is good they sell nuts as copra, otherwise it is more economical to sell dry coconuts (see Section 5.1). Fourteen of the 20 coconut vendors had cocoa holdings with almost all intercropped with coconuts. All claimed CPB had reduced their income. Many were selling dry coconuts to compensate for the loss of cocoa income, and most were not selling dry coconuts prior to CPB.

In ENB, the roadside sale of dry coconuts has emerged as an important supplementary source of income for a very limited number of coconut-cocoa producing households located along
the main road between Kokopo and Warangoi. This income opportunity has emerged because of the expanding number of people living to the south and east of Warangoi and the constraints on growing coconuts in the area. At these roadside markets a substantial volume of dry coconuts is traded, a volume far higher than that traded in the large urban marketplaces. But in most parts of the Gazelle, coconuts are plentiful and produced in large numbers by most households, so coconut producers have very limited ability to sell dry coconuts due to the very small number of potential customers.

4.2. West New Britain

In WNB three village roadside marketplaces were surveyed at Klin Wara, Kulungi and Mai: all located on the New Britain Highway. Kulungi is approximately 5 km to the north west of Kimbe towards Talasea. Klin Wara (Balabolo village) and Mai are around 15 and 18 km east of Kimbe, towards Hoskins, respectively. The Mai market is towards Bialla at the junction of the branch of the New Britain Highway running between Kimbe-Hoskins, and the branch of the Bialla Highway which runs initially south-east and towards Bialla. The three marketplaces are made up of makeshift bush material shelters, in some cases with tables. These shelters are located within relatively easy walking distance from the vendors’ houses and coconut palms. The shelters are clustered at Kulungi, in two locations, and at Klin Wara. The stalls at Mai are spread along one side of the road for around a kilometre with customers coming from east bound vehicles. The small household-run stalls, referred to as “famili maket” (family market) (Plate 4.5), are clustered in small groups of 1-6 vendors/households with each of the c.20 clusters separated by 10-50 metres (Plate 4.6). On the day of the surveys there were 42 vendors present.

Many of the vendors have enduring relationships with particular PMV drivers, who stop their vehicles at the same vendor repeatedly, and bring repeat patronage from the passengers who routinely travel on the same vehicles. Selling at the three locations is oriented towards travelling customers returning home from Kimbe. At Kulungi (Plate 4.7), this includes NBPOL workers from plantations west of Kimbe (including Numondo, Haella, Daliavu, Garu, Sapuri), people resident on Customary Rights Purchase (CRP) blocks (including at Ismin, Rerengi, Wenge, Kulu and Silo) and some town residents. At Klin Wara (Plate 4.8) and Mai, customers were reportedly from LSS blocks in the area and towards Bialla (including Kavui, Buvussi and Galai), plantation and other company employees (including from Dami, Waisisi, Buluma, Malalimi, Rigula, Akami and Kapiura and other villages along the New Britain highway towards Bialla) and some town residents. Company employees and CRP block holders often have limited access to coconut palms at their place of residence. The marketplaces also supply refreshments (betel nut and drinking coconuts) to travellers. Some coconuts purchased from

35 There was previously a single market where women from Mai sold, but there was reportedly some conflict due to competition and jealousy over customers, and some vendors also tired of transporting their coconuts a long distance to that market. These factors led to the establishment of the “family markets”.
these roadside marketplaces are resold at smaller marketplaces within LSS subdivisions and plantation residential compound areas.


Plate 4.6. Clustered roadside shelters at Mai, WNB. 2015. Note the village coconut planting in background.
Village coconut palms in background.


Vendors at all marketplaces were women from local customary landowning groups, with almost half from VOP blocks. Nine vendors were present at the Klin Wara market, 16 at Kulungi and 42 at Mai market. Dry coconuts were the most common items sold though there
were vendors selling other goods: the most common being betel nut, green drinking coconuts and fruits (Figure 4.3).

![Figure 4.3. Products being sold by vendors at the small WNB marketplaces.](image)

Mean returns made by vendors the last time they had marketed were highest at Klin Wara (K32) and Mai (K31) marketplaces (Figure 4.4). Income at Kulungi was 30% lower with a mean return of K21.\(^3\) This difference is likely due to the smaller population, and therefore less traffic and potential customers, towards Talasea compared to that towards Hoskins and Bialla.

![Figure 4.4. Mean returns last time selling at the market.](image)

\(^3\) These income figures were recorded in the whole of market survey, and are for the vendors’ last market day. Figure 4.6 shows vendor reported average returns for the sub-sample that undertook the detailed coconut survey.
Dry coconuts were being sold by almost all vendors at the three locations. Of the 9 vendors at Klin Wara 8 sold dry coconut, as did 13 of the 16 vendors at Kulungi, and 40 of the 42 vendors at Mai market. One vendor at Mai market was reselling coconuts purchased from a family member. All other vendors at all marketplaces were selling their own coconuts harvested from palms that were more than 20 years old; more than 60% were over 40 years old. The vendors favoured these marketplaces because they were located on busy main roads with regular passing customers. Also being located near to their homes, vendors could carry their coconuts and save on transport costs. Women also liked the plentiful space to display their coconuts unlike some of the larger marketplaces. Most vendors only sold at their respective familii marketplaces, and on average they marketed 3 to 4 times per week. The number of dry coconuts carried to the market varied across the three marketplaces. (Figure 4.5). Most dry coconuts were sold husked.

![Figure 4.5. Mean quantity of coconuts brought to market.](image)

The average selling price for dry coconuts was highest at Klin Wara and Mai marketplaces at around K0.48 (Table 4.3). Vendors at Kulungi were selling for 10 toea less. The selling price was reflected in the average income earned by vendors (Figure 4.6).

<table>
<thead>
<tr>
<th>Market</th>
<th>Price per dry coconut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Klin Wara</td>
<td>K0.48</td>
</tr>
<tr>
<td>Kulungi</td>
<td>K0.37</td>
</tr>
<tr>
<td>Mai</td>
<td>K0.47</td>
</tr>
</tbody>
</table>

37 The reseller at Mai market had purchased 56 coconuts from a family member for K10.
The sale of dry coconuts was the main source of income for the majority of vendors at Kulungi. Dry coconuts have been an important source of income for people in Kulungi following the closure of the Copra Marketing Board buying depots in 1999/2000 (Koczberski et al. 2006). Household surveys in the mid-2000s reported that the sale of dry coconuts was listed in the top 4 sources of income for 60% of women and 40% of men (Koczberski et al. 2006:43-4). Although most households at Kulungi have coconut plantings (92%), in 2006 only 6% of Kulungi households were producing copra (Koczberski et al. 2006:59-60). In the present study only one vendor from Kulingi and four of the 42 vendors at Mai indicated that their household produced copra. None considered it an important income source. For vendors at Mai and Klin Wara, oil palm was the most common primary income source for women (Table 4.4). Other important income sources included garden produce, betel nut, cocoa and store goods. Many vendors had cocoa trees and all had been impacted by CPB but as most were also growing oil palm this had not changed their marketing of dry coconuts.

Table 4.4. Vendors’ primary sources of income.

<table>
<thead>
<tr>
<th>Income source</th>
<th>Klin Wara</th>
<th>Kulungi</th>
<th>Mai</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry coconuts</td>
<td>1</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Oil palm</td>
<td>5</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Cocoa</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Garden produce</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Store goods</td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

Amongst vendors and their families in the three locations surveyed, the sale of dry coconuts is an important supplementary income source. Dry coconut sales make an important contribution to household livelihoods through generating regular, albeit small, incomes that contribute to routine family needs for cash for food, basic household items such as for soap

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38 These data are from the coconut vendor survey, and is the reported typical daily earnings by the vendors. The whole of market survey data included earlier is vendors’ earnings on their last marketing day.
and bus fares. The incomes earned selling coconuts on the roadside are significantly lower than what could be made selling fresh food in the urban Kimbe market, where on average coconut vendors and fresh food vendors reported gross daily returns of K68 and K73, respectively, on their last market day. But the sale of coconuts on the roadside involves no or very minimal expenses, and a smaller time commitment.

Vendors from the three locations drew on resources readily available to them to respond to the demand from the large number of households in the surrounding area that lacked coconut holdings. Vendors lived in close proximity to major roads which connect the urban centre of Kimbe with the LSS, CRP blocks and to NBPOL plantations where few people are able to grow sufficient coconuts for their family consumption needs. The oil palm industry shapes the wider cash economy within WNB, and oil palm producing households have incomes amongst the highest in rural PNG. Roadside coconut sellers have identified a means to tap into this broader wealth. No households are becoming wealthy from the trade in dry coconuts, and it is not an alternative to oil palm. But, for the small number of households involved in this trade, it is an important supplementary source of income and one that contributes to the broader distribution of wealth within the area.

4.3. Roadside marketplaces – summary and discussion

The number of small roadside marketplaces has grown over time, particularly along the country’s major roads. These marketplaces have become important sources of income for many rural people living along these roads, enabling people to access the wealth of passing travellers. The proximity of these marketplaces to people’s homes makes them accessible. In some cases these roadside marketplaces provide households, and particularly women within these households, with their main source of income. For other households, roadside sales contribute supplementary incomes, incomes that are nevertheless significant to livelihoods due to their regularity. The dry coconut focused marketplaces in ENB and WNB, described here, are part of this broader trend.

The coconut-oriented marketplaces discussed here, are located at particular locations along roadsides of major roads connecting urban centres with certain rural areas where there is strong demand for coconuts. In many coastal areas of PNG, there is a plentiful supply of coconuts, particularly in those regions where copra plantations and smallholdings developed. The ability to sell coconuts in local fresh food marketplaces is dependent on demand, and this frequently does not exist in a context where a large proportion of households grow coconuts. This means that the viability of roadside dry coconut sales is limited to a few select locations. In ENB, migrants to the new settlement belt, and who have had difficulty establishing new coconut plantings, are the major consumers driving this trade. In WNB, demand has come from migrant smallholders on the oil palm land settlement schemes (and more recently with oil palm blocks under customary rights purchases) where there is high population growth and resultant pressure on gardening land. Demand for coconuts is also from employees of NBPOL who maintain only limited gardens. Households with a sufficient supply of coconuts and residing close to the major transport routes along which those “coconut short” people travel,
have been able to take up this livelihood opportunity. They tend to make most of their sales in the afternoon when travellers are returning home. They mostly comprise women vendors, most of whom also sell, other fresh food and betel nut. The vendors are almost all customary landowners.

Coconut vendors, like all vendors selling at the roadside marketplaces, lived close by so were flexible in terms of when they marketed their coconuts. The marketplaces were convenient to walk to and vendors could carry their coconuts or push them in a wheelbarrow, thereby avoiding transport costs. These marketplaces are more relaxed and there is plenty of space for displaying coconuts. There is also commonly shade for sun and heat protection for the vendors, making the selling environment more appealing than that at the large urban marketplaces.

As with the large marketplaces, dry coconut vendors at the small marketplaces were selling coconuts from coconut palms that were almost all greater than 20 years old, many more than 40 years. The selling price was around K0.40 at the WNB marketplaces, yet at the ENB marketplaces average selling price was just above K0.20, reflecting both the overall wealth in the two provinces and the large supply of coconuts in ENB. Costs incurred by vendors were absent or minimal. Average incomes were less than K15 at the ENB marketplaces in contrast to the WNB roadside marketplaces where median reported daily incomes amongst coconut vendors ranged from K28 to K43 for the three markets surveyed. Marketing of dry coconuts is not lucrative, but it does make an important contribution to household incomes, particularly due to it being a regular – even daily – source of income, amongst those households able to access this livelihood opportunity.
5. DISCUSSION AND SUMMARY

In this final chapter, we return to the three questions posed in the introduction of this report to examine some of the factors underlying the observed increase in marketing of dry coconuts (as opposed to copra) by smallholders which started in 2012-13. Specifically, the research aimed to understand to what extent are dry coconut sales at marketplaces:

1. A coping strategy by smallholders to adapt to low and fluctuating agricultural commodity prices, especially copra prices.
2. An important source of income for cocoa smallholders to replace that lost because of CPB.
3. An ‘easy’ supplementary income source for women to maintain household food and income security.

Each is discussed below.

5.1. A coping strategy and better returns to labour?

The findings indicate that at the time of the study, roadside dry coconut sales were in part a coping strategy in response to low copra prices and vendors were taking advantage of the better returns from selling dry coconuts. Smallholders in PNG are very sensitive to returns to labour. Export crop smallholders typically have a range of income sources (Curry et al. 2015; Koczberski et al. 2019) and shift their labour in and out of these activities, depending largely on the relative returns to labour from the various activities, and their access to markets to sell their crops (domestic and export). When prices for a particular crop are high, and the returns on labour are good relative to other cash earning options, smallholders typically invest more time in that crop, and conversely when prices and relative returns to labour are low smallholders often reduce their labour on that crop (see Omuru et al. 2001; Allen et al. 2009 411-4). Smallholder households may shift their attention between different export crops, and from export crops to the sale of fresh produce at domestic markets (the sale of dry

39 In general, rural Papua New Guineans have tended towards diversification rather than specialisation. Most rural people have multiple sources of income, in addition to producing food crops for their own household’s consumption. For households with greater options available to them they may shift the weight of their attention between their different income sources. In more remote areas, income sources are more limited, and so people may continue to produce a crop even at very low prices, although they typically adopt a targeted approach, earning only enough for their immediate needs (such as to pay school fees). All the dry coconut sellers in this study live in accessible sites, although even within accessible sites there are individual households whose income earning options are more limited and who therefore continue to sell their crop when other households have withdrawn from that market.

40 Another contributing factor to labour decisions for cocoa and oil palm smallholders, is the quantity of accessible ripe crop. Accessibility of the crop impacts the ease of harvesting and therefore the returns on labour (Curry et al. 2007).
coconuts is part of this), as well as to other activities. In 2000, smallholders in WNB who grew both coconuts and oil palm continued to harvest oil palm despite low palm oil prices because of the collapse of copra prices (Koczberski et al. 2001:46). Similarly, very low copra prices in 2000 were believed to partially explain an almost doubling of production amongst village oil palm growers in New Ireland (ADS (PNG) 2001: 23). Likewise, in two New Ireland villages where copra and fishing were important sources of income, Dalzell & Wright (1990) documented that fish landings were negatively correlated with mean annual copra prices. Thus, relative returns are important.

This variable market engagement by smallholders, reflecting both harvesting efforts and access to markets, is evident in the changing levels of copra and copra oil exports shown in Figure 1.3. Low copra prices in the early 2000s, coupled with reduced market access due to the closure of buying depots and greater costs associated with transporting copra to the nearest depot, led to very poor returns to labour and low copra and copra oil exports (Allen et al. 2009:327). Since 2008, copra prices have been generally higher, however the price has been volatile, with very low prices in 2009 and 2013. The observed rapid increase in roadside dry coconut sales in 2013 was likely a response by smallholders to low copra prices at the time. Many female smallholders retained this coping strategy even when copra prices improved (Section 5.3)

Importantly, the impact of changing returns to labour on smallholder participation in different cash earning activities is shaped by the relative returns to men and women. Even in situations where export cash cropping offers the highest returns to labour at the household level, if women are not adequately remunerated for their labour, or they do not see their work to be benefitting themselves or the household, they may choose to focus their labour on activities for which they have greater control over the financial returns (Overfield 1998; Koczberski 2007). High export prices, then, do not necessarily lead to improved returns to labour for women, and this influences the price responsiveness of smallholders.

The recent rise of roadside sale of dry coconuts is, in part, a good example of smallholders’ sensitivity to price and their tendency to shift labour in and out of income earning activities when one offers a better relative return to labour. The dry coconut vendors interviewed in this study resided in areas where access to markets was relatively good and they had alternative income options beyond copra production which shaped how they adapted to changing environmental and economic conditions to avoid household food and income insecurity. Indeed, coconut, unlike other export tree crops, is well suited to fluctuating engagement by smallholders. Without pruning, cocoa, oil palm and coffee trees will suffer without pruning, cocoa, oil palm and coffee trees will suffer

Since the late 1990s, throughout the country fresh food marketing has visibly grown in importance, and in accessible areas of the highlands many households have shifted their attention from coffee to domestic fresh food markets (Sharp and Busse 2019; Curry et al. 2019).

Ageing palm stock is leading to declining yields over time, but does not explain the variable export volumes of copra and copra oil. Neither has there been any significant removal of palms or planting of new palms that would explain the variation in export volumes over time. Climatic variation from year to year has some influence on palm yields, however, export levels are primarily an indication of poor returns to labour leading to reduced smallholder harvesting efforts.

41 Since the late 1990s, throughout the country fresh food marketing has visibly grown in importance, and in accessible areas of the highlands many households have shifted their attention from coffee to domestic fresh food markets (Sharp and Busse 2019; Curry et al. 2019).

42 Ageing palm stock is leading to declining yields over time, but does not explain the variable export volumes of copra and copra oil. Neither has there been any significant removal of palms or planting of new palms that would explain the variation in export volumes over time. Climatic variation from year to year has some influence on palm yields, however, export levels are primarily an indication of poor returns to labour leading to reduced smallholder harvesting efforts.
from increased pest and disease infestations and substantially lower yields, whereas coconuts do not have pruning requirements and so suffer less under low-input smallholder agriculture. Much of the labour input for copra production is in harvesting and post-harvest processing, rather than in maintenance. Thus, smallholder households can readily vary harvesting efforts in response to prices. Coconuts are also not as perishable as most fresh foods, and so smallholders have some flexibility in when they collect and sell the nuts. Coconuts are also a particularly adaptable crop because they can be sold domestically as either dry coconuts or as drinking coconuts, and be used for human consumption and fed to pigs. That is, unlike coffee, cocoa and oil palm, coconut has established alternative uses.\(^{43}\) The vendors of dry coconuts are exploiting the multiple uses of the palm.

This flexibility in strategies practised by copra growers/dry coconut vendors, not only helps them meet short-term needs, but provides them with both economic and food security during times of fluctuating agricultural commodity prices. As studies in PNG and elsewhere in the Pacific reveal, flexibility in farming and livelihood strategies is critically important for enabling rural households to better manage risk and maintain the resilience of their livelihood farming system (Lauer 2014; Curry et al. 2015; Koczberski et al. 2018).

Although roadside dry coconut sales are in part a coping strategy in response to low copra prices, even with fluctuations in prices, the price received from a dry coconut in either the urban or roadside markets is consistently higher than what could be earned if that same coconut was sold as copra (see Figure 5.1 and Table 5.1). Between 2006 and 2013, the closest copra and dry coconut prices came was in 2007 when the dry coconut price was just under twice the copra price per coconut. In 2015 smallholders received around K850 per tonne for their copra (FMS). This equates to around 17t per coconut. This is lower than the roadside price at all the roadside and larger markets surveyed (see Table 5.1). The urban markets in ENB and WNB, and the roadside markets in WNB, had prices substantially higher; two to three times the equivalent copra price. The roadside prices in ENB were only marginally higher, but the returns to copra production are also reduced by transport costs to the mill, and for some producers also the cost of paid labour to process the dried coconuts, and the cost of using a copra drier. Roadside sellers incur none of these costs. The available data shows no direct correlation between the copra price and the price of dry coconuts.

\(^{43}\) In other parts of the world, palm oil is processed by smallholders for household consumption, but this is not practised in PNG.
Figure 5.1. Smallholder earnings per coconut comparing copra and dry coconuts sold in the Rabaul Market, 2006-2013.

Note: Copra price is calculated from FMS, and based on requiring 5000 coconuts to produce a tonne of copra (World Bank 1985). The dry coconut price is from the Consumer Price Index basket data for Rabaul. CPI data are yearly averages from available data. CPI price per kg data converted to price per coconut based on average husked coconut weight of 900g (calculated from average weight of 25 sampled coconuts from WNB, 2015).

Table 5.1. Average price per coconut for selected markets and smallholder millgate copra price equivalent, 2015.

Note: The FMS price per tonne has been converted to price per coconut based on 5000 coconuts to the tonne.

<table>
<thead>
<tr>
<th>Market</th>
<th>Toea per coconut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kokopo (urban, ENB)</td>
<td>58t</td>
</tr>
<tr>
<td>Mai (roadside, WNB)</td>
<td>47t</td>
</tr>
<tr>
<td>Kimbe (urban, WNB)</td>
<td>39t</td>
</tr>
<tr>
<td>Kulungi (roadside, WNB)</td>
<td>37t</td>
</tr>
<tr>
<td>Malakuna #4 (roadside, ENB)</td>
<td>26t</td>
</tr>
<tr>
<td>Bitavavar (roadside, ENB)</td>
<td>18t</td>
</tr>
<tr>
<td>Millgate copra (Fair Merchantable Standard)</td>
<td>17t</td>
</tr>
</tbody>
</table>

Allen et al. (2009:327) give “about 6000 full-sized nuts”. Using this figure, rather than the lower World Bank figure would further improve the relative returns for dry coconuts over copra.
For smallholders in locations where there is potential to sell considerable numbers of dry coconuts, as is the case at the roadside marketplaces identified in this study, the sale of dry coconuts rather than copra is a sensible strategy. There are, however, limits on the volume of coconuts that can be traded for domestic consumption, especially in locations where coconuts are widespread. There are very few locations in the lowlands where smallholders are able to make the sale of dry coconuts a viable activity. Even in locations actively involved in selling dry coconuts, their participation in the sale of dry coconuts is not necessarily at the expense of copra. Although on a per coconut basis, dry coconut selling offers better returns, in ENB at the time of the survey, 65% of roadside coconut sellers were from households also producing copra, an indication of both the limits of the dry coconut market and the absence of better alternative sources of income. By contrast, in WNB only 17% of the roadside coconut sellers were also currently producing copra, which reflects the presence of oil palm as an alternative source of income with higher returns to labour. For these women, dry coconut sales were more important than copra as a regular and fast source of cash.

The returns on dry coconut selling are further improved when relative labour inputs are considered. Copra production requires considerable labour (Plate 1.1). For a smallholder to produce a tonne of copra requires around 106 unskilled labour days (Gibson 1994). In 2015, the copra price paid to smallholders was around K850/tonne, which translates to around K8 per day. The earnings from roadside selling compare favourably. Median daily earnings by dry coconut vendors (also selling other items) at Bitavavar were around K12, and at Mai were K30. The labour to produce copra is also more arduous than the labour of marketing produce. The labour is also gendered. Roadside/marketplace sales of coconuts are overwhelmingly dominated by women, while post-harvest processing of copra is more commonly undertaken by men (Curry et al. 2007:48-51). Also as discussed further in Section 5.3, women are more likely to have greater control over the income they earn selling dry coconuts than household copra income.

Although smallholder households are better off selling their coconuts in local marketplaces rather than use them to produce copra, the gendered control of income may influence household decision-making. At low copra prices there is unlikely to be intra-household tensions regarding the disposal of coconuts, however as copra prices increase and men gain renewed interest in copra production, disagreements may emerge within some households about the proportion of coconuts directed to local marketplaces and copra. That said, the regular, though small, income from the roadside sale of dry coconuts is likely to remain part of the suite of household livelihood strategies, typical of PNG smallholders.

Although the returns on dry coconut selling are better than copra, it is not driving the shift of labour away from copra production. Periodic low copra prices and more attractive income alternatives, of which dry coconuts is only one, better explain the fall in smallholder copra

45Allen et al. (2009:412) report 130 labour days per tonne (see Allen et al. for sources and calculations). Where coconuts are intercropped with cocoa, some of the block maintenance work is divided between the two crops.

46 The daily returns on dry coconut selling only include harvesting and selling. They do not include block maintenance.
production as outlined in Section 1.3. Women are merely taking advantage of the unprocessed dry coconuts to sell at local markets. For some smallholders the alternatives are oil palm or cocoa, or peanuts, betel nut, and other fresh food, and for a few, dry coconuts. At the broader scale, the dry coconut market does not represent any competition for the supply of coconuts to the copra market.

5.2. An important income source for CPB-impacted cocoa smallholders?

Following the collapse of household cocoa income resulting from the impact of CPB, many women in ENB responded by increasing their production for, and participation in, local marketplaces (see Curry et al. 2012, Curry et al. 2015). Although the data are limited, some women in villages affected by CPB reported to have increased their sale of dry coconuts as they turned to alternative income generating activities (Section 3.1). Data from household surveys conducted in 2014 as part of the Food Security Project (see footnote 2) show that in ENB at Tavilo LSS, only 6% of households sold dry coconuts, but at Rabagi, where CPB had a very significant impact on livelihoods, 29% of households sold dry coconuts. Similarly, at Boiou in Milne Bay, where there was a heavy dependence on cocoa and where the impact of CPB had been significant, 30% of households reported to sell dry coconuts. In contrast, only 4% of households sold dry coconuts in Kaubwaga (Milne Bay), where cocoa was less important to livelihoods. The sale of dry coconuts by female cocoa smallholders was part of this wider trend. Prior to the arrival of CPB, the returns to labour on cocoa were substantially higher than those for copra. In the mid-2000s, the returns to labour on cocoa were double those of copra, even when the cocoa was sold as the lower value wet bean (Allen et al. 2009:412). However, the arrival of CPB significantly decreased the returns to labour on cocoa, and as a consequence copra temporarily became more significant to the livelihoods of some households, especially for men (Table 1.1). But with periodic low copra prices, many cocoa-coconut smallholders searched for other opportunities.

Because many cocoa growers had coconut palms intercropped with their cocoa, selling dry coconuts was an easy alternative source of income that could be adopted immediately to reduce the impact of CPB on household income insecurity. In ENB, around half of the dry coconut vendors reported to be selling more dry coconuts in marketplaces than they were prior to the arrival of CPB. In contrast, the dry coconut vendors in WNB who had cocoa plantings impacted by CPB claimed that their selling of dry coconuts was not in response to CPB. In part, this is because for many village women in the Hoskins-Kimbe area, income from oil palm and not cocoa was their major source of income, even prior to CPB. Thus, the study’s findings indicate that the increased sale of dry coconuts to replace lost income from CPB was a strategy found only among ENB dry coconut vendors and not WNB vendors who had better income choices.

5.3. An ‘easy’ supplementary income source for women?

For women who seek a supplementary income source that is not labour intensive, dry coconut sales were considered a convenient and fast way to access cash and diversify their economic
Livelihood strategies. Livelihood diversification is an important strategy for rural households in PNG. It contributes to greater resilience through reducing risk and maintaining household income and food security. Most rural households earn some income from both export cash crop production and the production of fresh food for local markets, and often from a range of other supplementary income sources. Oil palm and cocoa smallholder households, particularly those in more accessible locations, also earn income from other farm and non-farm income generating activities (see Curry et al. 2007; Koczberski and Curry 2005).47

Fresh food marketing, of which dry coconut sales are a part, provides women with an important supplementary income. Amongst oil palm producing households in the Hoskins area, oil palm is the most important source of income for most women (Curry et al. 2019:241). In the present research, 14 of the 20 women surveyed selling dry coconuts on the roadsides at Klin Wara and Mai (WNB) reported oil palm as their most important source of income. However, despite the importance of oil palm income for women, payments from the milling company are based on a 10 to 14 day cycle.48 Dry coconut sales provide women with a more immediate, although smaller income than oil palm. Income that can be earned frequently and relatively easily, yet may not be great, is valued by women as many are compelled to seek supplementary incomes to meet immediate household needs and daily living costs.

Women commonly use market income to purchase store foods like rice and tinned fish for the evening meal and their bus fares to town, and to cover small health and school expenses for their children. Women in particular need access to regular supplementary income because they carry a disproportionate share of the responsibility for childcare, family welfare, and household food supply. Roadside vendors in this study generally sell more frequently than do producer-sellers in the large urban marketplaces. At Mai roadside market 41% of vendors reported to have marketed produce on 5 or more days in the preceding 7 days, whereas at nearby Kimbe Market only 13% of fresh produce producer-sellers reported to have done so. Most (65%) fresh produce producer-sellers at Kimbe had sold only once or twice in the preceding 7 days, compared to 22% of vendors on the roadside at Mai.

A significant advantage of earning a supplementary income from the roadside sale of dry coconuts for women is that they generally have control over the income they earn. In PNG, women generally control the income they earn from small-scale fresh food marketing (Curry et al. 2019; Busse and Sharp 2019). The surveys of dry coconut vendors (both large market and roadside) show that the vendor in most cases controlled the income: 98% of respondents in Milne Bay, 88% of respondents in ENB, and 87% of respondents in WNB. This is in contrast to women’s access and control of income earned in household copra production. In their study of cocoa/copra producing smallholder households in ENB, Curry et al. (2007:48) reported that the laborious and lengthy time men invested in processing copra gave them greater claims than women on the income. In PNG, men commonly control the bulk of the

47 In the Hoskins area, surveys in the early-2000s reported that 62% of LSS blocks had another source of income in addition to income from oil palm and local fresh food marketing (Koczberski and Curry 2005).

48 Although where multiple households share a block, each household may not receive income every fortnight (see Koczberski and Curry 2016).
income from export cash crop production including from parchment coffee, cocoa dry bean, copra, and oil palm bunches. The export cash crops sold in this form can yield a large income for men. In contrast, women usually earn and control the smaller incomes from minor sales of these export crops in their less processed and lower priced form as coffee cherry, cocoa wet bean, and in the case of oil palm from the loose fruits (see Koczberski 2007; Curry et al. 2019). The sale of dry coconuts fits into both lower value export crop and small-scale fresh food categories.

Although women’s incomes from local marketplaces are small on a daily basis, across the year it is possible for the earnings generated from domestic markets to make a very substantial contribution to total household income. For example, on the roadside at Mai (WNB), median earnings from roadside selling on the vendor’s last trip to the market were K30 (a large portion of which came from dry coconut sales, but also drinking coconuts, betel nut and a few other items), and vendors reported selling an average of 4 days in the previous 7 days. If we assume these earnings and vending frequency are reasonably representative of daily earnings and participation over the year, then roadside selling at Mai could contribute around K6,240 per year to household incomes.49 In 2015, the same year as the survey, oil palm prices dropped by almost 30% from the previous year and it is estimated that incomes for village oil palm (VOP) smallholders with two hectares of oil palm, was around K5,216 that year.50 Thus, in 2015 income from roadside vending was possibly higher than income from oil palm for some smallholder households.51 Hence, if dry coconuts were sold on a regular basis, its potential contribution to supplementing lower than normal household oil palm income could be very important. At Malakuna #4 roadside (ENB), median earnings were lower at K23 per day, but vendors sold less frequently, only 1.5 days in the past 7 days. Again, assuming this is representative of the whole year, roadside selling there could contribute around K1794 to household income annually. Although much lower than annual vendor earnings at Mai, this is still an important source of income for those households involved.

A further advantage of roadside selling for women is its minimal labour requirements and flexibility. Although vendors in the large urban fresh food markets generally earned more than vendors selling dry coconuts on the rural roadside, a trip to the town marketplace involves considerably more planning and a greater time commitment than does roadside selling. Given the demands on women’s time and labour, access to a nearby roadside market provides them with greater flexibility in daily decision making regarding their level of market participation in response to other labour demands and household needs. Women did not need to dedicate

49 Caution is needed in relation to this assumption. Rural people’s participation in marketplaces can be spasmodic, with periods of both high and low levels of participation in response to changes in household cash needs at particular times. Nevertheless, in the case of Mai, with access to a popular roadside marketplace, the assumption is not unreasonable. See Section 1.8 for discussion of levels of marketplace participation.

50 Based on harvested production of 16 tonnes/ha (Steven Nake (OPRA) pers.comm.), and 2015 average oil palm fresh fruit bunch price of K163/tonne. In 2014, prices were K223/tonne, and in 2016 were K239/tonne. The last time prices had dropped below K170/tonne was in 2006

51 The different labour inputs, and the labour relative to income, for roadside marketing and oil palm have not been calculated. Roadside marketing likely involves greater time investment relative to income, though the type of work is less physically demanding.
the full day to marketing, and many sold mostly in the afternoons when traffic was greatest. Selling near to their house also enabled them to undertake other tasks, and to stop selling temporarily for periods of the day if required. Children could also accompany them to the market, allowing women to fulfil childcare responsibilities while also earning an income. Importantly, women valued roadside selling of coconuts because it involved minimal labour, and often considered it ‘free money’ because of this. It is relatively easy for a rural household to collect a small number of coconuts, along with drinking coconuts and betel nut to sell on the roadside. Roadside selling is also a highly social activity.

5.4. Dry coconut trading - future prospects

There is limited scope to expand the sale of dry coconuts. In ENB and WNB, smallholders have successfully responded to both market opportunity and livelihood constraints (fluctuating export crop prices, CPB, limited land access in the context of population pressure), and have flexibly adapted their livelihoods based on the resources available to them – coconuts and road access. In those locations where there is a viable market, people have responded.

As noted above, the sale of dry coconuts can be a good supplementary income source for households in certain locations, but the demand to purchase dry coconuts is limited in many locations. The majority of households throughout lowland rural PNG produce coconuts, so the market for dry coconuts is dependent on demand from people who cannot grow sufficient coconuts for their consumption. Urban populations and the highlands region are key sources of demand. In the highlands region, where 39% of the national population live, climatic conditions are not suitable for coconut fruiting. Coconut consumption in the highlands has been increasing, although remains at low levels. Hence, further increases in consumption presents the most likely source of future increased demand and expanded trading of dry coconuts (Section 1.5). There is some innovation in this market. In Goroka, where few households have their own coconut scraper, one marketplace vendor runs a small enterprise scraping coconuts with an electric coconut scraper.

Elsewhere the dry coconut trade is driven by demand from rural residents who do not have their own coconuts. But only a very limited number of rural coconut producers are positioned to respond to this demand, particularly those along certain major roads. In ENB, the establishment of selling rosters in the large ENB marketplaces, whereby on each day vending is restricted to people from particular villages, is a strong indication that supply outstripped demand in these sites.

The ability to earn income from dry coconut sales is particularly constrained due to its low value to bulk ratio which make it expensive to transport. This means dry coconut selling as a viable source of income is mainly restricted to those who happen to live in close proximity to roads along which ‘coconut-short’ people travel, or close to urban centres. Even for those best positioned to sell dry coconuts, this is not a lucrative market. Those wholesale traders who purchase in the lowlands and resell in the highlands market seem to have realised the best income from the sale of dry coconuts (see Plate 5.1).
Note: individual nuts being sold for K1.00 and K0.80. Bags of coconuts in background.

Incomes from the sale of dry coconuts are generally low, but the financial and labour inputs and risks are also low, especially when sold on the roadside. Coconuts are far less perishable and are more robust than many other forms of fresh food, so can be stored and sold over an extended period of time and travel well. Unsold coconuts can also always be processed to copra. The flexibility of coconuts as a crop – being able to be used for household consumption and other household uses, and sold both internationally and domestically – means the crop makes a valuable contribution to household resilience and food security. Coconuts as a crop are also very tolerant of severe climatic conditions, so households are still able to gain income from coconuts during periods when other crops are failing.\textsuperscript{52} Coconut plantings contribute to the livelihood options available to coconut smallholders, and their capacity to adapt in response to different threats to their livelihoods.

5.5. Research on fresh food markets

Marketplaces both large and small are of great significance to the livelihoods and food security of both rural and urban people in PNG. However, very little detailed research has occurred in these spaces in recent years, and what exists is both spatially and temporally

\textsuperscript{52} In 2015/2016, the Gazelle Peninsula and the Hoskins area did not experience the severity of impact from the El Nino induced drought and frosts as occurred in many other parts of PNG (see Bourke et al. 2016), nevertheless supply of certain crops in the food markets was impacted.
uneven (see Busse and Sharp 2019; Sharp and Busse 2019). Available recent quantitative data on PNG’s marketplaces is very limited, and so, despite the limitations of single day surveys, the surveys reported on here provide an important snapshot of PNG’s marketplaces.

The surveys document some important changes occurring in marketplaces. PNG’s marketplaces have historically been primarily places to sell fresh food items. Fresh food is still dominant, however, the surveys show a significant volume of manufactured or ‘store’ goods being sold by vendors (Plate 5.2; Figures 3.2 and 3.9). The vendors in PNG’s marketplaces have also historically been rural people selling produce they have grown themselves, with intermediary traders between the producer and consumer very uncommon (Sharp 2021). These surveys recorded a substantial proportion of vendors are now people residing in town, and many of these vendors are reselling produce purchased from the producer. The dominance of producer-selling in PNG’s marketplaces, has also meant that in the past people have generally attended the marketplace to sell on an infrequent basis, and had a low level of dependency on the marketplace. The present study, however, records a substantial number of vendors attending the market 5-7 days in the past week, and therefore strongly dependent on the marketplace for their livelihood.

Plate 5.2. Manufactured goods being sold alongside fresh food in Kimbe Market, 2015.

The report also documents the importance of roadside marketplaces. Roadside marketing has become increasingly common in PNG over the past two decades, and the Covid-19 pandemic has further increased this form of marketing (Bourke 2020). The study found that although the vendor earnings from roadside marketing are typically lower than earnings from selling in the large urban marketplaces, roadside marketing can provide a more regular and immediate source of income which, because it is close to the vendor’s home, minimises the costs and risks to the producer and can be readily integrated with their other livelihood activities.
Lastly, the report reaffirms the prominence of women vendors in the country’s marketplaces, and the importance of marketplaces as a source of income for women. This report contributes to a better understanding of the country’s marketplaces. However, given the significance of marketplaces to food security and livelihoods, and the changes that are being observed in marketplaces across PNG (Busse and Sharp 2019; Sharp and Busse 2019), far more research attention is needed, in particular detailed multi-sited studies that combine both quantitative and qualitative data.
6. REFERENCES


