Focus

Utilisation of indigenous nuts, spices and other minor crops in the Pacific region

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Pacific island countries are rich in indigenous food species with cash crop potential. Tree nut species such as *Canarium indicum*, *Terminalia kaernbachii* and *Barringtonia procera* are of particular note. Most spices and a range of other minor crops such as nutmeg, pepper, cardamom, vanilla, chili, kava, balsa wood and eagle wood also have potential for development. However, few of these minor crops have become established industries. This paper examines three case studies on vanilla, balsa wood and cardamom development in Papua New Guinea and compares them with the major export tree crop commodities cocoa, coconut and oil palm to identify reasons for their success or failure. Critical limiting factors and comparative advantages in minor cash crop development are identified. The poor extension service in Papua New Guinea and farmers' preference for low-input management systems are factors highlighted. Two new minor cash crops, galip nut and nutmeg/mace, which have been selected recently for research and development in East New Britain are also considered.

Few spices and other minor crops have become established industries in Papua New Guinea despite various research and development (R&D) attempts. Many factors can critically influence the successful establishment of a minor crop. These include crop cultivation, climate, soils, land availability, processing, quality, marketing, communications, transport, freight, infrastructure, finance, policies, support services, and law and order. Information from successes and failures can be useful in identifying critical limiting factors and lead to the successful selection and promotion of novel crops. Ideally, minor crop R&D strategies should focus on crops that have a comparative advantage and viable solutions to critical limiting factors.

Vanilla

Vanilla was first introduced to Papua New Guinea from Madagascar in 1963 and research on it commenced in 1968 (Aburu 1973). In the late 1990s, cyclones destroyed vanilla vines in Madagascar, the main producing country. World prices increased dramatically from around US$15.00 per kilo in the mid 1990s to over US$300.00 per kilo by 2002. Vanilla cultivation in Papua New Guinea quickly responded to the rising prices: many new vanilla farmers and traders emerged. Most, however, had little knowledge of the crop and many problems ensued. Papua New Guinea soon earned a reputation for poor quality. By October 2003, world production had recovered and prices plummeted almost

overnight. With oversupply and low prices, most small buyers in Papua New Guinea stopped trading and the remaining larger ones quickly became selective—only A Grade quality was purchased. The lower prices were unattractive to many farmers as compared with other cash crops and so many abandoned their vines. In 2007 PNG farmers are receiving about US$ 3.00 per kilo for green beans.

Problems are commonly experienced in the use of unsuitable vanilla species, a range of cultivation issues, harvesting practices, post harvest handling, and processing. The National Agricultural Research Institute (NARI) produced twelve vanilla extension booklets, called TokToks (Ling 2003a) on cultivation and processing issues, and many thousands of stakeholders were trained by NARI. Unfortunately, the provinces lacked the capacity to continue the extension support. The critical limiting factors were documented in a TokTok (Ling 2003b) and sent to the DAL and the Spices Board urging, in particular, for attention to quality standards No response was received and no action ensued. Essentially, the vanilla industry was left to fend for itself. Sadly, in Papua New Guinea this has been and continues to be the case for most minor crops.

Vanilla is a labour-intensive crop and requires a high level of technical knowledge at all stages: growing, harvesting, post harvest, and processing. The world market is very small and so the crop is very vulnerable to oversupply and marked price fluctuations. Longer term sustainability will depend on farmers' ability to address the many critical factors identified above and the relative attractiveness of vanilla. Processing within the country could address the high export air freight cost. High quality standards are essential if the PNG vanilla industry is to survive and expand. A coordinating body is seen to be essential to ensure high quality standards and to parent the emerging crop.

Balsa wood

Industrial grade balsa is used in construction activities where strength and light weight are required such as boats, aircraft, and windmills. High grade balsa is required for the smaller hobby industry. Balsa chip, wood dust and bark can be used to make medium density fibre boards. The world requirement for balsa wood is small and slowly increasing.

Balsa was introduced to Papua New Guinea some time prior to 1938. Balsa has become an established minor crop in East New Britain, with sustained production and export. A balsa-strengthening project for East New Britain was funded by the International Tropical Timbers Organization from 1996 to 2001, focusing on silviculture, tree improvement and seed selection, and management techniques (Howcroft 2002). Balsa is an extremely low management-input crop requiring few to no inputs from six months to harvest. Harvesting and transportation to a central processing unit are usually done by the buyer. 'A' Grade quality balsa is light weight and without stain. Lower grade balsa can be used for some industrial purposes. Drying is usually done in simple hot air driers fueled by wood, including the balsa waste.

The small balsa industry in East New Britain has expanded noticeably over the past ten years due to successful marketing of a very good product. However, almost all balsa projects in Papua New Guinea that have been attempted outside the Gazelle Peninsular have failed, mainly due to marketing issues—transport and freight costs. The main reasons for the high quality of the balsa from East New Britain are the ideal tropical climate and rich, well-drained volcanic soils that produce very light-weight wood. Good road infrastructure links producers and processors and good shipping services exist for export to Asia and Europe. The relatively high labour

costs and poor extension services in Papua New Guinea are not issues or critical factors with balsa cultivation because the crop has very low labour and technical input requirements. Exporters harvest and collect the crop, so transport is also not an issue. However, the small world niche market makes balsa very venerable to over-supply and prices may suffer if other countries commence production.

Cardamom

Cardamom was introduced to Papua New Guinea via LAES in East New Britain in 1966. Cardamom is easy to cultivate; it has few pest and disease problems; and harvest and post-harvest practices are simple. This minor crop is another example of a low labour and low technical input crop. In the late 1980s, cardamom prices fell and at about the same time production and exports from the province sharply declined—it was assumed and often quoted that the low world price was responsible. At first the crop was bought by the Department of Primary Industries and farmers were paid at the farm gate by government warrant. However, the buying visits were spasmodic and payments often delayed. A private exporter commenced traveling to the area on a set day each week and paid cash at the farm gate: cardamom production in the area immediately responded though the price was still low.

Cardamom is one of the few cash crops suitable for mid-altitude (700–1,500 metres). Production has been sustained through sharp price cycle swings: from farm gate highs of around US$2.50 per kg dried cardamom in 2003 to lows of US$1.00 in 2007. Low production quantities are an issue. Higher prices for spices are paid to some 132 smallholders who currently have organic certification in East New Britain.

Major export tree crops

The three major lowland export tree crop commodities in Papua New Guinea—cocoa, copra and oil palm—have some similarities. Cocoa has a high labour and technical requirements, both in the establishment and production phases, yet most smallholder cocoa farmers in Papua New Guinea operate low-input, mixed-cropping management systems (Moxon and Sitapai 1984). The result, not surprisingly, is low cocoa productivity—average smallholder yields nationwide are 0.3–0.5 tonnes dry bean per hectare, while the best commercial yields are over 3 tonnes per hectare. The recent incursion of the debilitating Asian cocoa pod borer (CPB) pest in East New Britain poses a very serious threat to the East New Britain and PNG cocoa industry.

Oil palm has very low labour and technical input requirements and hence productivity is high. This bulky crop is harvested and transported by the exporter from a nucleus estate, thus relieving farmers of this potential problem. Coconut also has low labour and technical requirements. However, the market price usually makes it difficult for farmers to cover the cost of transporting the bulky crop. Hence, in most locations, marketing the crop is difficult and in some places economically impossible. Cutting copra is also very tedious work, and a beetle pest prevents new plantings in the islands region. Most existing coconut plantings are old/senile, usually existing as a food or companion crop to cocoa. It is not surprising therefore that there is relatively little interest in coconut redevelopment in Papua New Guinea: the long-term future of PNG copra does not look good.

Analysis of vanilla production identifies intensive management problems and how these, together with the price crash, resulted in the decline of the industry. The successful, large, oil palm industry and the small balsa and cardamom industries in East New Britain

share similarities. All have low labour and technical knowledge requirements and have overcome critical limiting factors, such as harvesting, post harvest, processing, transport and quality control, with similar strategies. In choosing new crops for development in Papua New Guinea, past experience shows that we should aim for those crops that have low labour and technical input requirements, high crop value, low harvest, post harvest and processing requirements by the farmer, reasonably good industry knowledge, and strong comparative advantages. Two crops have been identified and are currently being promoted. These are the indigenous galip nut and spice nutmeg/mace.

Nutmeg

Nutmeg (*Myristica fragrans*) is a medium-sized tree that produces two high-value spices called nutmeg and mace. Wild nutmegs are native to Papua New Guinea. Nutmeg was identified as a potential cash crop by LAES many years ago. Nutmeg, like galip, requires little management input after establishment and can be grown in existing cocoa, coconut and banana farming systems. Harvesting is easy and nuts are sold as nut-in-shell to the spice buyer, of which there are several in the province. Following research on nutmeg selection and propagation, twelve élite nutmeg clones are now being mass produced for release to farmers over the next two years under the new EU Galip Nut and Nutmeg development project.

Galip nut

The indigenous galip nut was identified as a promising cash crop by scientists at LAES in 1989. A Horticulture Industry Sector Study (McGregor 2003) concluded, '[t]ree nuts probably offer the best export market prospects of any horticultural product from PNG'. A one-year feasibility study of galip (Nevenimo et al. 2006a–c; Bunt 2006; Leakey et al. 2006; Nottingham et al. 2006) reinforced the selection of galip for cash crop development in Papua New Guinea. Two main issues were highlighted by the study: a dependable supply of a quality product and processing knowledge. Three donor-funded projects are currently addressing these two issues. Substantial investment has been committed to the birth of two new export cash crop industries for Papua New Guinea, commencing, in East New Britain.

Conclusions

Where farmers have adopted a culture of low management farming and where extension services are poor, an appropriate response would seem to be to select those new crop species for development that have low labour and low technical input requirements. Other critical limiting factors also need to be defined and effective strategies adopted based on sound experience. HIV/AIDs may be extensive in Papua New Guinea in about ten years unless considerable effective interventions are made now. Those most affected will be the rural communities—smallholders and subsistence farmers. The disease will severely reduce the healthy working population and, in many cases, children and elderly may have to tend the crops. The low management input systems identified above are seen to be a viable strategy to combat the potential adult labour shortage issue.

Papua New Guinea and other countries in the Pacific region are rich in indigenous food species with crop potential. There is potential for collaboration between Pacific island countries to produce and promote new agricultural products, for example, to establish a Pacific regional production chain for the supply of galip nuts to export markets over an extended fruiting season. Regional quality standards also could be developed for some crops. Kava has this need to avoid health issues again threatening the export industry as a pharmaceutical product. Okari is an excellent quality nut originating

from mainland Papua New Guinea. Pau and Aila are also good quality nuts found throughout Melanesia that have potential for development. Many of these nuts are very nutritious and some are traditionally stored for long periods (galip for up to one year) thus contributing to food security, particularly in adverse weather conditions such as El Niño years. Research is thus required to identify additional indigenous crop candidates and to produce strategies for their development. Indigenous nut and fruit trees clearly stand out from the many available options.

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