Bringing hope to remote island communities with virgin coconut oil production

D. Etherington*

Abstract

There is new hope for the coconut industry of the South Pacific region with the advent of modern small scale processing technologies. Such technologies allow for the commercial production of Virgin Coconut Oil (VCO) at the farm level. The implications are manifold because VCO is arguably the most useful vegetable oil in the World. With micro processing into final products, the coconut can reclaim its titles of "king of palms" and "the tree of life". VCO has immediate medicinal, cooking, massage, cosmetic and fuel uses both for the local economy and for export. These commercial uses of coconut oil were denied to coconut farmers for decades as they were urged to produce copra for the export market. Although coconut is the most abundant and sustainable rural resource of the islands, it became increasingly viewed as just a subsistence crop since farmers were less and less willing to engage in the hard and dirty work of producing copra for export. There have been major failures by export marketing authorities, and by research institutes, who have only focussed on embodied crop technologies. These failures occurred amid volatile and falling prices of coconut oil on world markets and had catastrophic consequences for farmers and their families. Product diversification and attention to processing technologies, drawing on local knowledge and directed towards local demand, were largely ignored. These are the keys to sustained benefit. This paper looks at the potential contribution of small-scale processing to income, health and environmental sustainability by drawing on the experience of working with the Direct Micro Expelling (DME) technology for over a decade.

Introduction

The history of the coconut (*Cocos nucifera*) oil production in the South Pacific is interesting. For western colonial interests, the dried flesh of the coconut fruit, transportable to distant markets and known as copra, was their primary attraction as a source of vegetable oil for industrial extraction. The initial strategy was to encourage expatriate companies and individuals to set up large plantations using the abundant land resource and local or imported indentured labour. Processing was confined to weight reduction of the bulky coconut fruit by extraction and drying of an exportable commodity. Coconut palms constituted an abundant renewable resource on the groups of small islands and atolls which make up the land area of the South Pacific nations and were valued and accorded special status in the local life, culture and rituals. However, it was only after WW II that local populations began to participate seriously in copra production. Post-colonial history has been woven around copra as a primary export, with rural households producing the copra for cash income. Coconut products continue to play a central role in the livelihood of the subsistence societies of the South Pacific.

For the governments of the South Pacific nations, the value of a living coconut palm has been dependent only on the price copra-based coconut oil fetched in international markets. The copra produced in the South Pacific is only a tiny proportion of the world production. Furthermore, world production of coconut oil is barely 4% of the total production of the nine major vegetable oils. Its price in international markets is not only on a significant long-term decline but also, more importantly, is highly volatile. In an analysis of the price-instability of 42 primary commodities in the period 1950 to the late 1980s, the World Bank found coconut oil to be the most unstable (World Bank, 1990). Halving or doubling of the price of coconut oil quoted in Rotterdam within the space of a single year was not uncommon.

*Managing Director, **Kokonut Pacific Pty Ltd**, PO Box 4088, Hawker, ACT 2614, Australia.
Email: dan@kokonutpacific.com.au; Website: www.kokonutpacific.com.au
Coconut revival: new possibilities for the 'tree of life' ACIAR Proceedings No. 125, Canberra 2006, pp 57-64.
(Proceedings of the International Coconut Forum held in Cairns, Australia. 22-24 November 2005)

The policies of the governments and international research priorities sought to increase the yield potential of coconut in order to restore the value of the palm to the communities. This paper argues that the supply of coconuts is not the problem, but it is the use to which the existing supply is put that is critical.

The aim of this paper is to show that the long-term coconut policy needed to reap the real value of the coconut palm should rely heavily on alternatives to copra, and introduce appropriate coconut-processing technologies that match the factor proportions as well as engage local knowledge. A key to success is wider participation of local people, and dovetailing of products to niche markets and domestic demand. This argument has been presented in detail elsewhere (Etherington and Mahendrarajah 2001). Here we revisit the fact that coconut oil can become a significant energy resource for remote island communities. This illustrates the scope for increasing domestic demand and shows how import substitution can moderate the volatile copra price in South Pacific communities. There is new hope for the coconut industry of the region following the advent of modern small scale processing technologies. Such technologies allow for the commercial production of virgin coconut oil (VCO) at a farm level and thus contribute significantly to farmer income, improved health and enhanced environmental sustainability. The paper draws on the experience of working with the Direct Micro Expelling (DME) technology for over a decade.

Coconuts and the Pacific

Coconut palms are ideally suited to the humid tropical coastal climate. They thrive even in poor sandy soils and tolerate short-term exposure to saline water. The coconut palm may live beyond 70 years, needing hardly any nurturing, and propagates by seed (nut) only throughout its life. The nuts are produced year-round at regular intervals on bunches of 5 to 20 nuts. The coconut palm is often referred to as "the tree of life" in the South Pacific nations (Ohler 1984) because of the regularity of production, its multiple uses, its resilience to cyclonic wind and its longevity.

With a myopic focus on copra for export, governments have failed to recognise and capitalise on the multiple alternative uses of coconut. The extraction of the kernel from mature fruit for copra production was arduous, dirty work. Rather than being regarded as a desirable means of earning cash, it was viewed as a necessary evil. In many instances it was the only means of earning cash for school fees and medical care, and for obtaining modern conveniences. It was an inefficient use of forest resources in cutting firewood for drying the copra. Copra itself was a polluted raw material which locked out producers from final products as they lacked the means to extract the oil from it. As world prices declined, so farmers abandoned many of their coconut groves and simply collected enough nuts for their own household needs and for feeding their livestock, principally pigs.

It is only an increase in demand for the nuts derived from other marketing opportunities that will raise farm incomes. When such derived demands are stable the income will be sustained. The benefits of an increase in demand will be widespread, benefiting all existing producers in the short run without any gestation period, quite unlike the supply side policies of the perennial crop research institutes. The focus need not be on nuts alone. The coconut palm produces many different raw materials which can be processed into an extraordinarily wide range of products. The most advantageous feature of the coconut palm is that it produces fruit and fronds continuously year-round with little seasonal variation. This feature is ideal for on-site small-scale processing enterprises as it avoids any raw-material storage issues.

The relatively rich rural resources of the islands and the lack of acute human population pressure prompted the economist Fred Fisk to coin the phrase “subsistence affluence” to describe this situation in the South Pacific. **A** traditional island economy emerging from subsistence with the sale of copra is portrayed in **Figure 1**. In addition to an increasing reliance on aid flows from official and non-government organisation sources, rapid population growth of over 3% could quickly lead away from self-reliance to the subsistence poverty of so many areas in Africa and parts of South Asia.

Coconut products

The coconut provides some of the healthiest food products known to mankind. By following the copra-route, downstream processing virtually destroys its nutritional values. Kiln or sun drying of copra, with unhygienic handling and storage, changes a highly edible product into something potentially toxic. The high temperatures used to make copra and copra-oil destroys essential amino acids and tocopherols (vitamin E) (Banzon and Velasco 1982). The nutritional qualities of copra-cake are degraded and the coconut oil expelled from copra is inedible. Refining the oil is essential. Processing via copra severely limits the alternative market potential for downstream coconut products. Finally, copra oil extraction is a centralised and large-scale operation carried out in metropolitan centres. Hence, it does not match the abundance of available labour in these economies, and offers no scope for participation and development of skills within rural areas.

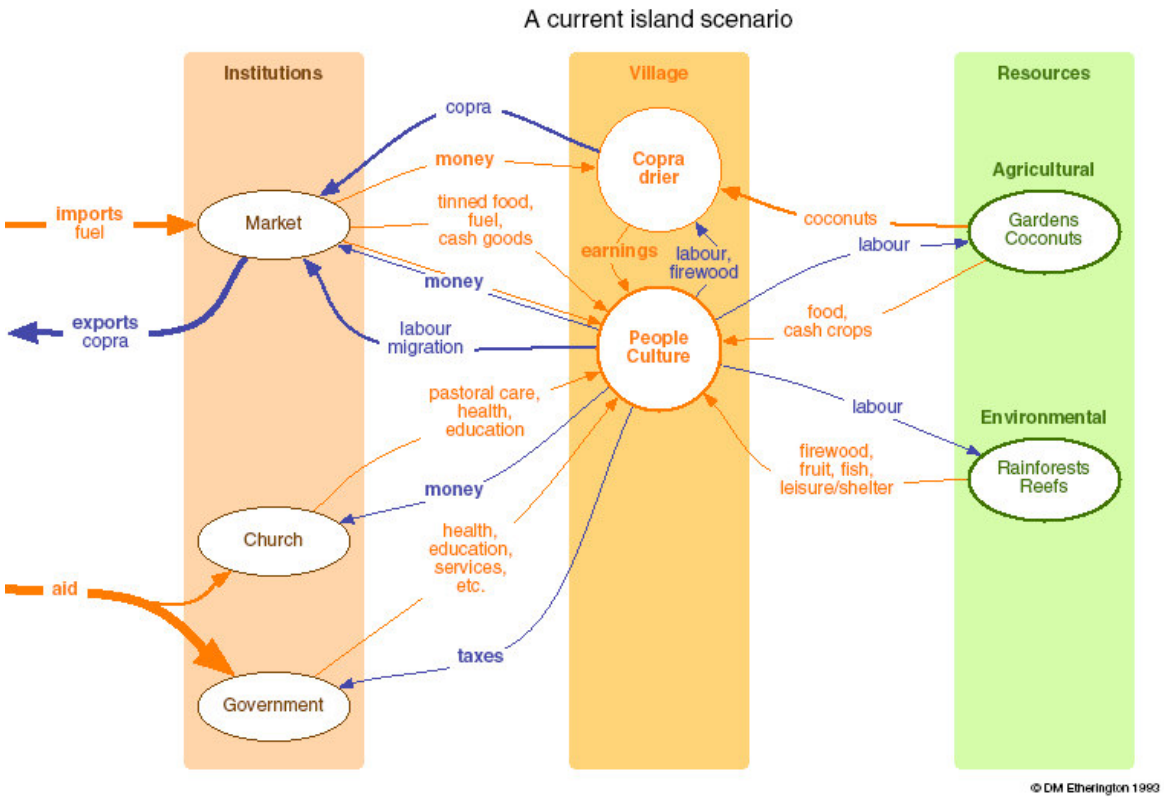

Figure 1. Flow diagram of a current or traditional island scenario of economic activity

The key to enhance demand, and for widespread diffusion of benefits, is coconut product diversification in rural areas, and new markets for the existing products as well as new products. There is growing interest at the community level in alternative processes and product diversification. New markets should include the domestic market including import substitution. Farm-level production of VCO provides the greatest potential to enhance local demand, as it suits product diversification and import substitution. VCO offers immediate access to edible oil, massage oil, medicinal products, liquid fuel, soap and edible meal. These commercial possibilities for coconut oil were denied to coconut farmers for decades as they were urged and given support only to produce copra for export.

Farm-level production of high-grade VCO provides increased rural employment. It effectively uses an existing, sustainable, renewable rural resource that is available year round. New technologies for VCO are culturally sensitive, income generating, health promoting and greenhouse-gas friendly. The VCO industry could kick-start the rural economies of failing South Pacific states and become the means by which the coconut industry can reclaim a significant national role.

Much has also been written about the fossil fuel dependency of the Pacific island nations, with the value of fuel imports often exceeding the total value of export earnings. Liquid-fuel is used for extensively for land transport, inter-island shipping, diesel generators of electricity, fishing vessels, motorised canoes, lamps and lighting, refrigeration and some cooking stoves.

As an example, fuel imports are already expensive on arrival in Honiara, Vila or Suva. To this must be added import duty and, when the fuel is distributed beyond the capital cities, the cost of repackaging into 200L drums. There are also shipment costs to outer islands plus the sales margin at each step in the marketing chain. The result is a dramatic increase in fuel prices in rural areas.

The impact on price as imports move from the central port to the remote areas is illustrated in **Figure 2**. Each ring in the diagram represents some change in the mode or form of transportation. For example, the goods may move from ocean-going ferry to wharf to truck to canoe to tractor and trailer. It also shows the increase in the value of export products as they move from the remote points of production towards the port.

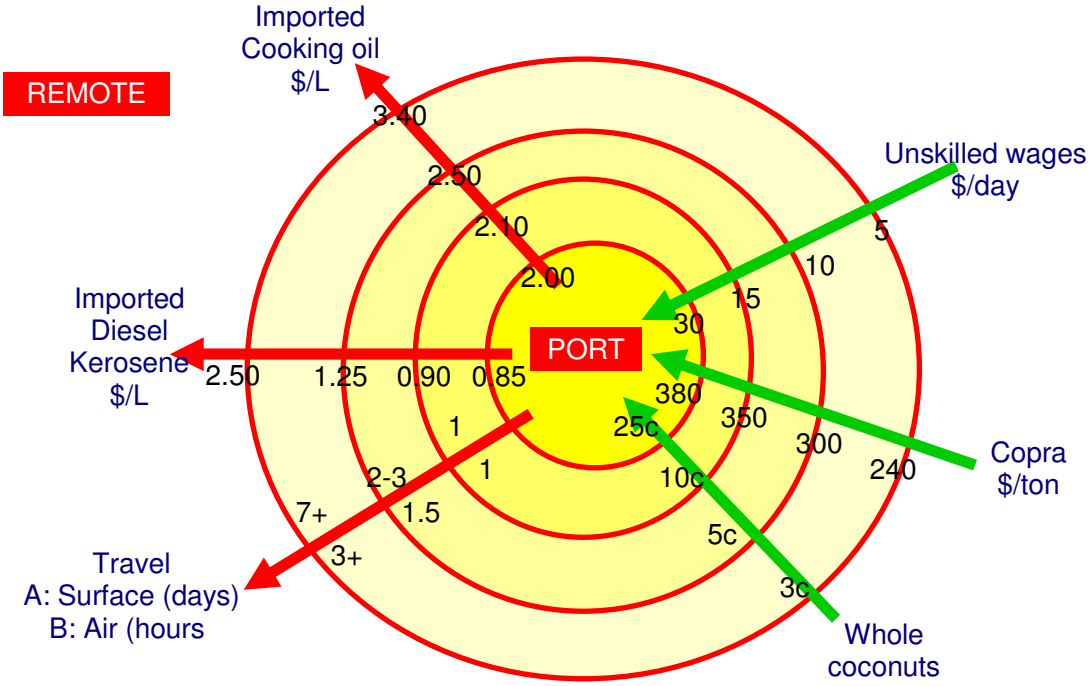

Figure 2. Coconut product trade: price (US$) vs distance from site of production to port, and port to consumer.

The definition of what is "remote" will depend on the product that one is concerned with and the ease or otherwise of moving it between the centre and the periphery. The price differentials are notional but (in AU$) they approximated reality a decade ago.

Closer to the current situation is shown in **Figure 3**. Effectively, whole island nations are becoming "remote" in the fossil-fuel economy as world fuel prices rise.

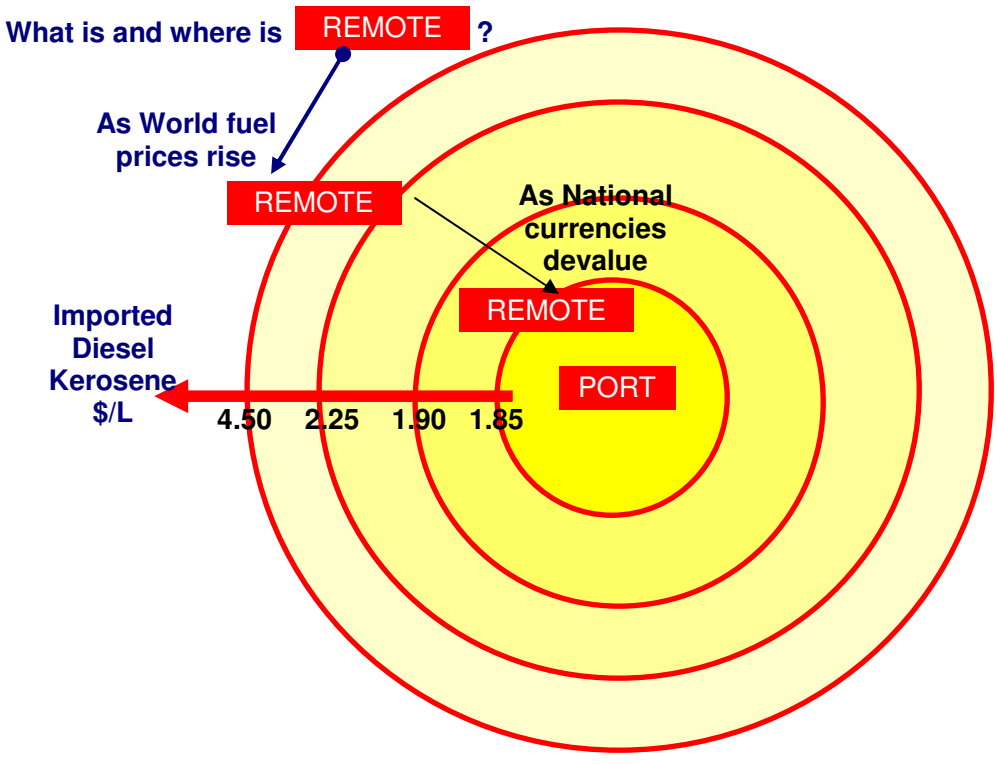

Figure 3. Relative remoteness as mineral fuel prices increase and local currencies devalue

In addition to the rise in world petroleum prices, many national currencies have devalued significantly in recent years so that in local currency terms the cost of imported fossil fuels has skyrocketed. Now is the time to actively pursue means by which locally produced coconut oil (CNO) can be substitute for imported fuels.

We have written extensively about the practicality of using coconut oil (CNO) as a direct bio-fuel substitute for diesel and as a blended substitute for kerosene. Coconut oil is a natural bio-fuel, since no chemical alterations have to be made to the oil in warm climates. Also, no modifications need to be made to the diesel engines themselves. The further bonus is that the fuel is non-polluting, with zero net Greenhouse gas emissions.

It is an irony that the Clean Development Mechanism (CDM) of the Kyoto Protocol currently excludes tree-crop plantations like coconut, oil palm and rubber from carbon sequestration credits. This is surprising since these long-lived perennial plantations are very similar to forest plantations in the carbon benefits they offer.

While the only major commercial product of the forests is timber, the plantation crops give regular harvests of fruit or latex in addition to timber. Thus they provide renewable energies (oil as a substitute for petroleum fuel, biomass and biogas) and substitution products (natural latex as a substitute for synthetic rubber) which make them readily compliant with other CDM projects. Also, in the case of coconut, most of the palms are owned by smallholders who comply with other main CDM goals like poverty alleviation and sustainability.

Direct Micro Expelling

The comparative advantage of remote locations is that, in contrast to high and rising prices of imported liquid fuels and oil products, they have low prices of raw materials. The relatively low cost of nuts and labour could make production of CNO for fuel an economic proposition. The key requirement is an appropriate method of oil extraction that can take advantage of this price-cost differential. The Direct Micro Expelling (DME) technology that we have developed offers such a method. DME gets its name from the fact that it is **Direct** in the sense that it 'strikes oil' within an hour of cracking open a nut; and it is **Micro** since it is a small-scale (family farm) operation requiring 4 to 6 adults engaged in **Expelling** the oil. Such units have been producing 30 to 50 L/day of oil on a regular basis.

The DME process is very easy to learn. It simply involves grating the flesh out of fresh mature coconuts, weighing out a batch and drying it on a purpose-build, shell- and husk-fuelled drier, and pressing out the oil in a manual press. DME VCO is a pure, natural and stable final product with a long shelf life. Its free fatty acids level is as low as 0.1%. Given the freight difficulties in remote areas, localised production of final value-adding products should be commercially viable in many situations.

We have helped set up DME units across the South Pacific, including the Marshall Island, Kiribati, PNG, Solomon Islands, Vanuatu, Fiji, Samoa and Tonga. Many of the units are isolated and cater for local demand. For example, some are directly linked with boarding schools where the oil is used for cooking, making soap and as a fuel for diesel generators. It is indeed a most versatile oil.

The challenges of DME have included such issues as the equitable sharing of the benefits of paid employment; jealousy of those in leadership at a site and also between families; absenteeism of trained personnel; and discipline in quality control. Such problems are typical teething problems with any new technology. We have found that the constructive sharing of the problems can lead to a village designed solution. For example, in terms of the authority of the team leader in the DME operation, a parallel was drawn with the role of a canoe captain who has authority at sea but whose authority ceases once they come back into the village.

Our experience suggests that a successful future for such micro enterprises requires a focused organisational structure with regular oil collection schedules, payment to producers, quality control, and credit and marketing structures. All of these are critical but it is not clear as to how they can be provided in many situations. For example, political instability (in Fiji, Solomon Islands, Indonesia, E. Timor and Papua New Guinea), poor governance with corrupt & bankrupt commodity marketing boards and development banks, the lack of credit structures for rural income-generating projects, and the environmental impacts of logging and cyclones all militate against the successful implementation of DME. The Solomon Islands has provided a worst-case scenario, where, with institutional bankruptcy, came lawlessness, an inability to market cash crops, a collapse of transport systems, plummeting rural incomes, a lack of social services, and an inability to pay school and medical fees. It involved a virtual return to subsistence and barter trade.

In the case of the Solomon Islands, we have partnered with a local company to set up a vertically integrated commercial "DME System" that provides full support services. (**Figure 4**.)

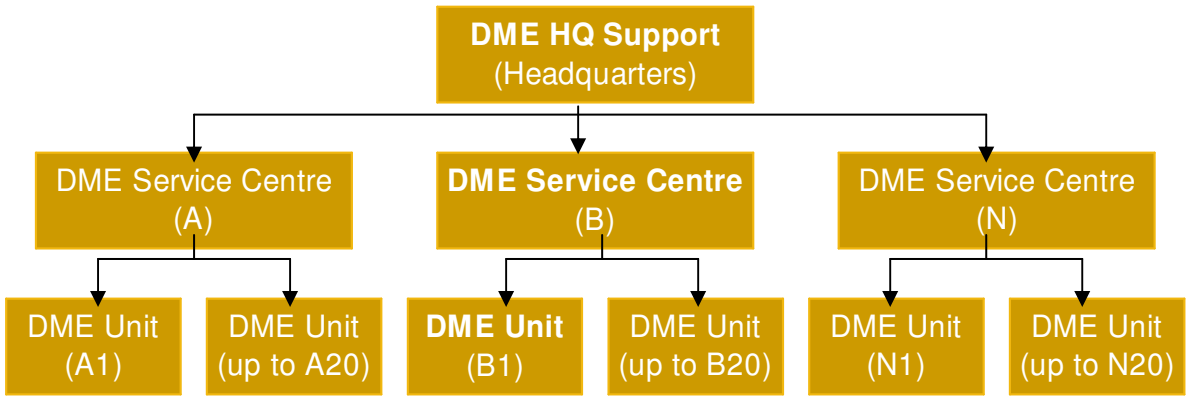

Figure 4. The 'DME System' is a vertically integrated commercial organisation

The vertically integrated system provides equipment, credit, training, extension, oil collection, quality control, marketing and administrative services. The introduction of the system on three islands in Solomon Islands has had a profound impact on remote communities by providing employment and raising rural incomes, resulting in improvements in health and education. Rural communities are producing extremely good oil in larger volumes than can be absorbed by the local domestic market. Over a period of eighteen months, ten DME units have produced about 100,000 litres of export grade VCO. About 80% has been exported, earning the country considerably more than AUS$ 250,000. Gaining "Certified Organic" status has been crucial obtaining access to the niche international market for VCO.

However, marketing of VCO is greatly hindered by the consistent message of The Heart Foundation of Australia that coconut oil is the one vegetable oil that should be avoided at all costs because it is a saturated fat. CNO is condemned as a danger to our health, and yet it is used as the fat in feeding formula for premature babies and for adult patients with compromised digestive systems. The medium-chain fatty acids of CNO are also highly valued by elite athletes. An increasing number of scientists and nutritionists now tell us that VCO actually raises HDL (the good cholesterol), minimises free radicals and has significant anti-viral and anti-bacterial properties (Enig 2000; Fife 2003).

Local and in-country markets for the oil are developing slowly. Sales are being made through rural shops with a "fill-your-own-bottle" service from the tap on a 60 L barrel. Soap production has started. The oil is being blended with kerosene for hurricane lamps and it was a major breakthrough when a rural tractor owner began to use VCO when diesel supplies failed to arrive. He has been so satisfied with the result that he says that he has permanently switched fuels. Progress is slow because of the limited resources to devote to promotional activities.

Rural electrification becomes a real possibility with locally produced fuel powering relatively inexpensive Chinese diesel engines. Innovative schemes have been suggested using such gen sets to charge batteries that are hired out and used to power economic LED lights. We have spoken to two companies actively working on a new generation of local diesel-powered, water-jet, mini-cargo vessels for transporting people and goods within protected waters (mainly the lagoons) and for reef fishing.

People have written about the need to "replant the tree of life" (Persley 1992); others have urged the need to "rehabilitate the tree of life" (World Bank 1991). I have suggested that we "reclaim the tree of life" because the resource already exists in abundance (Etherington and Mahendrarajah 2001)! It has the potential to become a veritable sustainable gold mine! A perpetual oil well! The potential future of the islands is portrayed in **Figure 5** - when their existing, renewable and sustainable coconut resource provides them not only with food and shelter but also with a safe liquid fuel that will bring hope to remote rural communities.

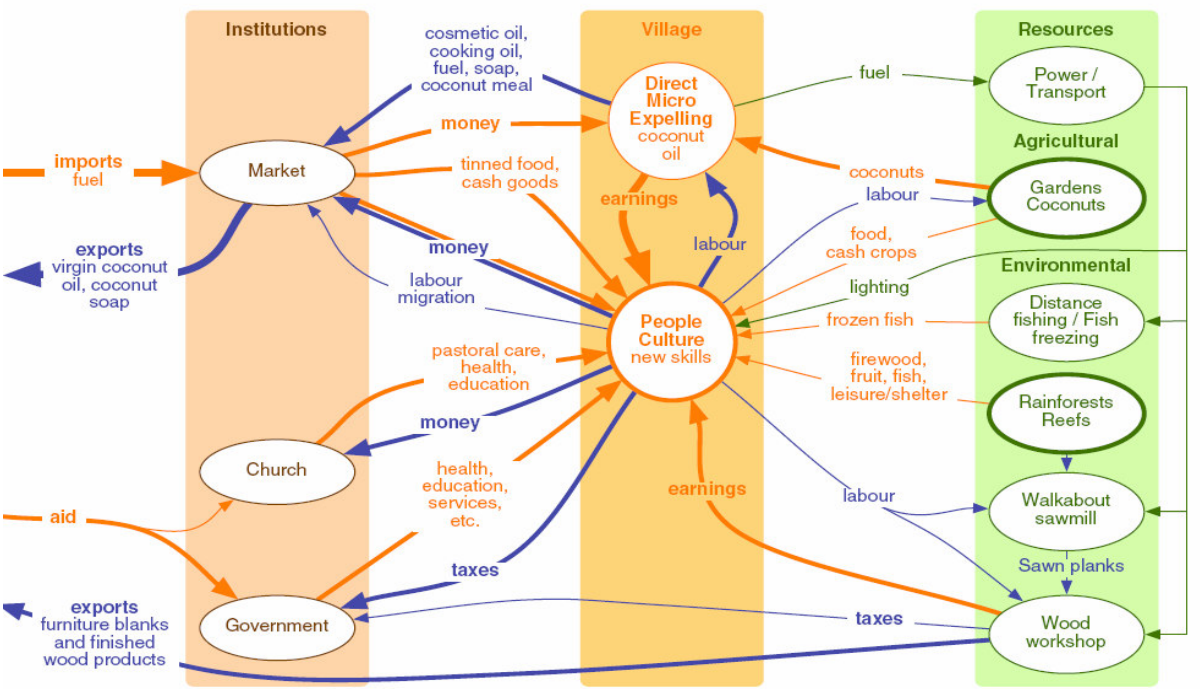

Figure 5. The renewable coconut resource allows for a sustainable development scenario

Summary/conclusion

The advent of modern small-scale processing technologies allows for the commercial production of VCO at the farm level. The implications are manifold because VCO is arguably the most useful vegetable oil in the world. VCO has immediate medicinal, cooking, massage, cosmetic and fuel uses both for the local economy and for export. These commercial uses of coconut oil were denied to coconut farmers for decades as they were urged to produce copra for the export market. As the price of copra declined, farmers were less and less willing to engage in the hard and dirty work of producing the commodity. The commercial failures of copra marketing boards were critical. At the same time research institutes focused on long-term crop breeding technologies that had little relevance to farmers faced with volatile and falling prices on world markets. Product diversification and attention to processing technologies drawing on local knowledge and directed towards local demand were largely ignored. Local production of final products is the key to significant improvements in income, health and environmental sustainability for South Pacific nations. This potential is being demonstrated by the DME technology.

References

Banzon, J.A. and Valesco, J.R. 1982. Coconut production and utilisation. Philippine Coconut Research Development Foundation: Manila.

Enig, M.G. 2000. Know your fats: the complete primer for understanding the nutrition of fats, oils, and cholesterol. Bethesda Press: Silver Spring, MD, USA

Etherington, D.M. and Mahendrarajah, S. 2001 Reclaiming the tree of life: coconut in the South Pacific. Paper presented at 'The Future of Perennial Crops, Investment and Sustainability in the Humid Tropics' conference, Yamoussoukro, Cote d'Ivoire,

Etherington, D.M., Mahendrarajah, S., and Kennedy, O. 1999 Biofuel energy from coconut for South Pacific island economies: technology, economics and institutions. New and Alternative Energy Technologies Symposium,XIX Pacific Science Congress, Sydney.

Fife, B. 2003. The healing miracles of coconut oil. Piccadilly Press: Colorado Springs, USA.

Ohler, J.G. 1984. Coconut, tree of life. FAO Plant Production and Protection Paper 57. FAO: Rome.

Persley, G.J. 1992. Replanting the tree of life: towards an international agenda for coconut palm research. CAB International: Oxford.

World Bank, 1990. Price prospects for primary products. Report No. 814/90, volume II: Food products and fertilizers, and agricultural raw materials. Washington, DC, USA.

World Bank, 1991. Coconut production: present status and priorities for research. World Bank Technical Paper 136. Washington, DC, USA