

## **Valuation and registration of customary land in Papua New Guinea**

### **Abstract**

This paper considers what an opportunity cost valuation of customary land can tell us about the pressures for land registration in Papua New Guinea. The discussion here presents a historical perspective on land registration, introduces land disputes and land markets in PNG, explains an opportunity cost valuation of land, and then suggest ways in which such valuations can help us interpret the processes of land registration. Calculations on the economic value of customary land draws on data from pilot surveys of land use in two provinces (Madang and Oro). This opportunity cost valuation demonstrates that low financial returns mislead and lease valuations probably greatly underestimate the real value of productive land in PNG. The historical experience of land registration in Africa does not support the current promises of rural credit, greater security of title and greater agricultural productivity through land registration. Further, evidence on the existing value of subsistence and cash crop production, when compared with the current value of land leases, suggests a great undervaluation of customary land is taking place. The paper concludes that the historical record on registration, combined with opportunity cost valuations, places a strong onus on the advocates of land registration to answer specific questions over the serious risks to small landowning families in Papua New Guinea.

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## Valuation and registration of customary land in Papua New Guinea

Customary land in Papua New Guinea is not a general commons, but it is a form of collective and inalienable title which adapts and sustains common benefits, over many generations. Unusually in the world, most ordinary people in PNG have some access to customary land. However this form of title is under persistent attack from the international financial institutions, aid agencies, large corporations and forces within the PNG government. The first step in transforming customary title is land registration, a process which defines title and opens it up to commercial transaction. An immediate problem of this is that a once priceless asset is opened to the vagaries of the commercial world, in a traditional environment where price often has little to do with value. On the few occasions where customary land has been registered, then leased, given over or sold, there are enormous disputes which revolve around loss of benefits, and sharing of benefits of the land. The question of valuing customary land, therefore, is of considerable importance to the small landholders which happen to make up the majority of PNG's population.

This paper considers what an opportunity cost valuation of customary land can tell us about the pressures for land registration in Papua New Guinea. Is this a neocolonial drive for dispossession, consistent with the colonial history of registration, or is there evidence that it represents (the modernist claim of) opportunities for subsistence farming families (most of whom are customary land holders) to enter the cash economy?

Papua New Guinea has one of the most equal distributions of land and natural resources on earth. Commentators generally accept that 97% of PNG's land is owned by families and administered by clan leaders under customary law. The PNG government explains:

“Legitimate land ownership and the right to exploit most natural resources is vested with the people of Papua New Guinea. Ownership is mainly governed by traditional law. About three per cent of the land in Papua New Guinea, or about 600,000 hectares, is outside of this system .. only 30,000 hectares of alienated land is freehold and 60,000 hectares is used for public purposes. About 200,000 hectares is leased to the private sector” (Embassy of Papua New Guinea 2004).

It is thus incorrect to assert, as does Helen Hughes (2004), that customary land in PNG is ‘communal’, in the sense of being an unowned commons.<sup>1</sup> Clan leaders and families have custodial responsibility for the overwhelming majority of Papua New Guinea's land. Some commentators (eg. Fingleton 2004) accept that customary land groups are essential to the viability of communities.

Unlike Latin America and India, there are no big landlords. PNG is a country in which the colonial regimes (British, German and Australians, from 1884 to 1975) did not markedly upset traditional land tenure. Only about 3% of the country's land is ‘alienated’ from customary title, most of that in the townships and held by the state. Commercial operators such as logging companies, large plantations and miners have generally carried out their operations on leased customary land (leased to the state, then leased back to the company) but pressure has persisted over several decades for a more general land registration process.

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<sup>1</sup> Two western academics (arguing the virtues of private ownership, but with little reference to PNG's customary law) have suggested that customary tenure may apply to only 20% of the cultivated land PNG, and that most of the rest is “a commons open to undifferentiated access by all” (Curtin and Lea 2006: 171). Neither the Government nor the law of PNG recognises such an argument. Under customary law PNG's clans and families have custodian responsibility for forests, hunting grounds, nature reserves and natural features such as mountains, as well as garden and residential land.

Registration is said to represent commercial opportunity for small land holders, but it also introduces the threat of dispossession.

The discussion here presents a historical perspective on land registration, introduces land disputes and land markets in PNG, explains an opportunity cost valuation of land, and then suggest ways in which such valuations can help us interpret the processes of land registration in Papua New Guinea.

## **1. Promises and lessons of land registration**

The Australian aid agency AusAID, over the past two decades, has backed 23 projects to the value of \$130 million in land titling and land administrations, often projects co-financed by the World Bank. AusAID argues that these projects add to security of land rights and target rural poverty (AusAID 2000). In Papua New Guinea, AusAID funded a series of land titling projects through the 1990s, linked to forestry, natural resource information systems, regional development, coastal management and direct 'land mobilisation' (see Rusanen 2005). The aim has been to shift areas of land under customary title into the registered and indefeasible Torrens Title system, a move which clearly has wide ranging implications for PNG citizens, the vast majority of whom currently have some access to land. The World Bank, a global agency which promotes private foreign investment, has a long history in land titling and land registration (see Holstein 1996) and argues the economics benefits of registration and land markets for small farmers (eg. Deininger 2003). Giant mining companies such as BHP have been directly involved in World Bank land titling projects, across the Asian region (Burns et al 1996). These powerful interests are backed by some academics (eg. Lea 2004), who have argued that the institution of customary land has obstructed agricultural productivity and output. Some even claim customary title is "the primary reason for deprivation in rural Pacific communities" (Hughes 2004: 4). In the general clamour for registration, arguments suggest the macroeconomic desirability of 'mobilising' land for export oriented resource industries and cash crops (such as oil palm), and that ordinary poor communities can better make use of their land assets through registration, which could provide greater recognition of their tenure and thus access to mortgage finance, as well as potential income from leases.

However, land registration processes clearly have their origin in the dispossession of indigenous peoples. On the African continent, in the colonial period, land registration was initially about colonists accessing indigenous land: "Almost all land registration systems introduced in colonial Africa before 1950 .. were primarily intended to secure European rights to land." (Dickerman et al 1989: viii). In Algeria in the 1840s, the French passed laws to dispossess indigenous people on "public interest" grounds, handing over their land to colonists. In Belgian occupied Congo and Rwanda-Burundi colonial laws banned Africans from owning land in certain areas (Dickerman et al 1989: ix-x).

In Australia in the 1830s Robert Torrens, chief architect of the Torrens Title system of land registration, engaged in a debate with the British colonial office over the possible land rights of indigenous Australians. Robert Torrens believed "they have none" (in Reynolds 1987: 114). The subsequent Torrens system, introduced in South Australia in 1857-58 (see Esposito 2003), combined a system of registration with 'indefeasibility', a legal protection from almost all other claims except fraud. This Australian colonial innovation was adapted by French as well as British colonial regimes in Africa, for example in French Equatorial and French West Africa (Dickerman et al 1989: ix). Registration was also used for political settlements. In the

conflict ridden kingdom of Uganda, for example, registration was introduced in 1900 to allocate lands to “members of the royal family, nobles and 1,000 chiefs and leading private citizens” (Dickerman et al 1989: x).

In the late colonial period, land registration for select groups of Africans (‘native purchase areas’) was introduced in Southern Rhodesia, and this was “the result of a compromise whose principal goal was to assure Europeans exclusive access to freehold agricultural land. The Swynnerton Plan in Kenya in the 1950s similarly backed access to registered land for Africans, with modernist goals of “greater security to landholders, enhance the freedom to transact land and serve as a basis for agricultural credit” (Dickerman et al 1989: x-xi). These are essentially the same arguments used today, by the World Bank. However the Swynnerton Plan was also a response to rebellion at colonial rule, and was aiming to “create a class of African freeholders, yeoman farmers” who would have a stake in the regime (Dickerman et al 1989: xi).

Kenya became the African country with the greatest extent of registered land, and therefore also the greatest field for study of the lessons of registration. Reliance on the development of freehold land continued after independence, in Kenya and several other African countries. In the Sudan, during a large World Bank agricultural expansion program (1969-71) all lands not registered were deemed (by the Unregistered Lands Act) to belong to the government. This act dispossessed a very large number of traditional users, who then had to work leased land. Apart from the predictable problems of incomplete registers, analysts have concluded that these changes “brought an end to sustainable patterns of land use by local people, replacing them with mechanised shifting cultivation which has degraded the land and helped initiate desertification in some regions” (Dickerman et al 1989: xvi).

Lawrence, the chief British expert on and proponent of land registration, came to the view that registration should be used only when the economic advantages justified it. That is, when there was a “general demand” for registration, when the costs were not high and where there were likely gains in agricultural productivity (Lawrence 1970). More critical of the registration process was Okoth-Ogendo, former Dean of Law and Nairobi University, who concluded that the benefits were outweighed by specific disadvantages: the redistribution of political power, creation of economic disparities, generation of a ‘disequilibrium’ in social institutions, failure to develop extension and rural credit, and a general failure to improve agricultural productivity. He noted that, of the new registered land owners, less than 5% were women; further, the new land regime was “creating new forms of stratification and status differentials” amongst the small farming sector (Okoth-Ogendo 1986).

Looking at the African evidence more recently, researchers from London’s International Institute for Environment and Development have concluded that “the hoped for benefits of registration do not accrue automatically and, in some circumstances, the effects of registration may be the converse of those anticipated” (Cotula et al 2004: 3). Registration may exacerbate land disputes, elite groups may claim land beyond their entitlements under the customary system, those without education or influence may find their land registered to someone else, secondary owners of land such as women “often do not appear in the land register and are thus expropriated”. In Kenya, there was “no significant correlation” between registered land title and rural credit, there were “negative repercussions” on vulnerable groups and “more generally, land registration reinforced class and wealth differentiation” (Cotula et al 2004: 4-5).

At its own independence in 1975, Papua New Guinea embedded in its constitution two contrasting principles of land law. First, the recognition of customary law and customary land title, which had been maintained almost intact (except for some alienation of land for the townships, some plantations and returned soldiers schemes). Second, there was in principle recognition of the Australian colonial innovation of Torrens title. In contrast to customary title, Torrens title represents possibly the most highly commodified form of land title in the world. Since PNG's independence, these two elements, customary title and Torrens title, have enjoyed an uneasy coexistence, with registration hovering as the available means of converting the former to the latter.

## **2. The failure of rural land markets**

The main obstacle to land registration in PNG is that it is unwanted; there is no popular demand for it and, on the contrary, popular opposition has been expressed strongly on several occasions, sometimes leading to loss of life (see Uni Tavour 2001). The second obstacle is the absence of a functioning rural land market, one that might deliver some satisfaction to all parties concerned. The small amount of rural land that has been given over, leased, sold or simply stolen from customary owners is riddled with disputes. These disputes involve complaints about the misappropriation of customary land (eg. Yambai 2003), complaints of environmental damage to the land and to surrounding areas (eg. from logging and mining on customary land), complaints over the failure of promised benefits from land development (eg. promised roads or health centres) and complaints concerning the unfair sharing of benefits of commercial development (eg. from plantation cash crops) (eg. K. Koja 2005). The persistence of these complaints indicates the endurance of belief in customary rights and responsibilities. The complaints also demonstrate the extent of dissatisfaction with past land agreements and land transactions. When we look at some of the lease values, it is not hard to see why there is dissatisfaction.

Lease values on rural land (relying on economic liberal principles of willingness to pay and prior transactions) have come up with values as low as 20 Kina per hectare per year, plus some royalties (Gou and Higaturu 1999). In one case, royalties appear to have lifted 20 Kina rents to 100 Kina per hectare per year (King 2001; Higaturu 2003). In another case, a group of West New Britain villagers have leased over 700 hectares of land for forty years (another lease-lease back arrangement, and also to an oil palm company), for only 20 Kina per hectare (Mara and others 1999). Valuer-General schedules on rentals for residential, commercial and industrial land show much higher values (DTI 2001) but these are mostly urban based and reflect the highly restricted supply of urban property.

Rural land markets are highly limited, the customary land owners are asset-rich, cash poor and have very little information on the real opportunity cost value of their land. Better information on the opportunity costs might encourage higher lease values, but an oversupply through large scale registration and transactions could lower them.

One example of the broader dissatisfaction with rural land transactions can be seen in the oil palm industry, where there are multiple land disputes associated with estate, mini-estate and land settlement scheme (LSS) land – in other words with all the forms of land tenure associated with oil palm. These disputes are aggravated by the customary landowner observation of large amounts of money extracted from their traditional lands by the oil palm mills, and the proceeds not being properly shared by their communities. There have been

ongoing conflicts on the LSS blocks in both Hoskins (West New Britain) and Popondetta (Oro). In 1993 settlers on 173 leased blocks at Kavugara (WNB) abandoned their block following pressure from local customary landowners. This land was handed back to the original owners, who developed part of it as a mini-estate, and then leased it to the local milling company (Koczberski, Curry & Gibson 2001: 124). Similar evictions occurred in Popondetta, and a major election issue in 1992 was "Oro for those from Oro". Many blocks were abandoned across all LSS divisions (Koczberski, Curry & Gibson 2001: 128). At the root of these land conflicts is customary owner non-acceptance of final dispossession, and a maintenance of relationships with ancestral lands, despite lease or even sales.

In Oro the 'Sangara Crown lands', on which the Higaturu mill and estate, and Popondetta township, are built, have been under constant dispute since independence. An area of land amounting to more than 14,000 hectares was transferred from 'Natives to the Crown', beginning with deeds in 1910 and 1917 which purported to exchange a large amount of 'unoccupied ... good agricultural land' land for tobacco, axes, knives and matches (eg. Papua 1917). After independence, and after numerous disputes, there was a 1979 National Lands Commission hearing into 14 different claims from the Sangara Pressure Group. At the final hearing in 1981 the landowners were awarded 200,000 Kina. The settlement covered several villages (Hohorita, Kakandetta, Ahora, Soputa, Mangi, Waru, Iwore, Koipa, Hamburata, Kanari and Dobuduru villages). The state wanted to "stop once and for all" any further claims (Secretary for Lands and Physical Planning 1995); but there are still land and environmental damage claims, from the Kakandetta and Ahora groups (K. Koja 2005).

In 1999, the Higaturu company (in Oro Province) extended its plantation lands by acquiring 20 year leases on customary land for 'mini-estate' plantations. Lease-lease-back arrangements go through a formal process of the land being leased to the state for a peppercorn rent (say 10 Kina) then leased back to the company, with the state playing a protector's role over the use of precious customary land. The Gou lease involved a 20 year lease on 91 hectares of land, with a set rent of 20 Kina per hectare and royalties at 10% POPA per tonne FFB (subject to review) (Gou and Higaturu 1999). '10% POPA' means 10% of the farmer gate price per metric tonne. The Heropa lease, for 88 hectares, went through some negotiations in which the landowners were unsuccessful in raising base rents and royalty percentages. They had little bargaining power. Actual payments to the Heropa group of landowners in 2001 suggest that rents were also fixed at 20 Kina per hectare per year, with royalties at about 10% or 15% of the farm gate price (King 2001 & Higaturu 2003). This amounts to an annual royalty of about 80 Kina per hectare. Putting the rent and royalty figures together we come up with a combined land value payment of about 100 Kina. A payment of 100 Kina per hectare per year might seem significant for 'unused' land held by cash poor families; however it is a very small fraction of the potential earning capacity of good agricultural land in PNG.

This example from the oil palm industry demonstrates that the value of customary land has been set at a nominal and extremely low rate. 'Low' may also mean zero. In calculating the 'costs' incurred by village oil palm farmers, for the purpose of a profit sharing agreement with the milling companies, Burnett and Ellingsen (2001: 31) did not include any rent component. The fixed capital and depreciation costs of the company were considered as costs, but the villagers' contribution of customary land was not. However, customary land clearly has alternative economic uses which are precluded by serving the large local mill. It does seem to be a common non-indigenous assumption that customary land, because of the

virtual absence of rural land markets, has no economic value at all. Such an assumption can have serious consequences for small families.

My calculations of subsistence values (see below) show that a hectare of customary land can easily produce several thousand Kina per year in food and housing value equivalent, as well as up to several thousand Kina per year in cash crop revenue. Customary owners are to some extent aware of the extent of this value; so why have some of them agreed to rents of between 20 and 100 Kina per hectare?

I suggest several factors are at work in the failure of Papua New Guinea's rural land markets:

1. Landowners generally lease just some of their land, maintaining enough for houses and gardens. This is not necessarily 'surplus' land, as fertile agricultural or forest land is most often targeted by those wanting access. However, at the same time, land that has not been developed for gardens is not necessarily given an exchange value, and the strong custom of sharing assets has not always require a market 'premium'.
2. The lessees are most often a single company, and often a company backed by the regional or national government. There is no real competition, in the sense of another bidder for the lease. Thus the key ingredient of the liberal theory of allocative efficiency in markets – competition – is missing.
3. Cash poor, asset rich families are vulnerable in exchange, as there are pressures to earn money to pay their children's school fees and health service fees. They are vulnerable to cash offers, and can easily undervalue their assets.
4. Cash crops are valued in exchange terms, but undeveloped or potential cash crops are often not factored into the calculations of customary land owners with little information and little education.
5. The subsistence value of land (for most villagers with productive land) is usually regarded as a given (until it is taken away) rather than an equivalent exchange value, which might have to be compensated. This is particularly the case for customary land owners with little information and little education.
6. False promises of the likely benefits from 'development' are common in PNG. Logging companies promise roads and health centres, which often do not materialise. Mining and logging companies do not properly advise of environmental and social impacts. Oil palm companies promise inflated income opportunities. Poor families are vulnerable in the face of such misinformation.
7. Finally, there is fraud in the setting up of Incorporated Land Groups (ILGs) and the leasing of customary land. One such case at Collingwood Bay (Oro Province) was overturned by the courts, in 2002 (Tararia 2003).

Combinations of these factors, I suggest, have led to a massive undervaluing of customary land in PNG, on the few occasions that there have been transactions. A general sense of this undervaluation continues to fuel substantial dissatisfaction and disputes over land.

### **3. An opportunity cost valuation of land in Papua New Guinea**

In face of the failure of PNG's rural land 'markets', we need some means to estimate the minimum value of customary land, not necessarily to determine a sale or lease price, but at least to indicate what quantum of compensation lease prices would have to meet. The simplest way to do this is to sum the estimated opportunity cost of minimal subsistence (food and housing) production, plus some measure of the current cash crop production on customary land. This can conveniently be done per nuclear family, which in Papua New Guinea represents two adults and 5 children.

Customary land has important subsistence value, as well as alternative cash crop potential, even for those participating in large cash crop industries. This is noted in practical surveys, though usually not given a monetary value. Koczberski et al note that about 80% of the diet of Kavui and Popondetta LSS farmers was from garden food, and that most women (100% on LSS blocks and 52% on VOP blocks) regularly sold market food, many relying on the market as their main source of income (Koczberski, Curry & Gibson 2001: 50 & 57-58).

Based on food market values (see Appendix Table 1) and a consumption survey (see Appendix Table 2) I have estimated the subsistence value of food and housing from customary land at a rough average of 13,500 Kina per year (see Appendix table 5). This figure represents the amount an average family would have to spend on food and housing rent, in local markets, if they did not have their land and gardens. This subsistence figure is, in most cases, greater (usually much greater) than the cash income from crops sold by families.

There are certain assumptions behind these calculations, which I should spell out. First, production on customary land has been reduced to an estimate for an average family of seven. Second, land alienation in the model means complete dispossession – where, in practice, perhaps one quarter to three-quarters of a family's land might be leased. Third, an attempt has been made to draw attention to the implications of different prices in regional (ie. Goroka and Madang) and capital (Port Moresby) markets. Fourth, 'subsistence' value is only estimated for food and housing, and so excludes many other benefits from customary land (see Powell 1976), such as access to materials for medicines, fuels, fences, weapons, tools, canoes, textiles, string bags, cords, musical instruments, artworks, articles of personal adornment, ritual and magic (the equivalent value of these resources is much more difficult to calculate.). Fifth, the additional costs of urban lifestyles and processed food consumption have been excluded. Estimating the actual opportunity costs of customary land in particular circumstances is complicated; however that the principle of a real opportunity cost is, I suggest, very clear.

This notional 'ordinary' household comprised two adults and 4-5 children, which is roughly the national average. Daily consumption figures were then multiplied into an annual figure, which could be set alongside annual cash income and annual rents in regional towns. The annual cost of purchasing the food consumed by such families ranged from 3,431 to 6,169 Kina (in regional markets) and 7,260 to 11,388 (in Port Moresby) (see Appendix Table Two). I have rounded this to create a value range of 3,400 to 11,400 Kina per year.

Rental equivalent values are difficult to apply, as town housing is limited and expensive, while village housing is constructed cooperatively, mostly from local materials, and is rent free. School teacher rentals in villages in Madang and the Highlands seems to range from



zero (where housing is simply provided for the teacher) to 20 Kina per fortnight (Sinemila 2004; Paol 2004). But teachers' accommodation is a special case. A more likely alternative housing option for landless families is settlement housing, on the fringes of the towns. However I have chosen 'basic' town rental housing as the most reasonable equivalent. The annual cost of housing in Madang town, can be as much as 1,500 to 2,000 per month for a 'decent' house; however a 'basic' house in town would rent for 500 Kina per month, or 6,000 Kina per year (Chitoa 2004). This seems the closest substitute for secure, village housing. The figure of 13,500 Kina per year 'subsistence value' is thus gained by adding subsistence food and basic housing value equivalents.

To such subsistence values we must add current cash crop options, to be able to estimate the necessary compensation for a full plot of customary land, if it were to be leased. Domestic trade in PNG is substantial and varied. Bourke et al (2004) list 180 traded ('economic') crops across the whole of PNG. In 1995 the Fresh Produce Development Corporation estimated total PNG fruit production at 58.35 million kilograms (valued at 88.08 million Kina) and total PNG vegetable production at 47.32 million kilograms (valued at 53.53 million Kina). Biggest fruit and vegetable crops by value were apples, watermelon, bananas and pawpaw, and potatoes, cabbage, tomatoes and carrots (FPDC 2004: Table 1c). High and diverse production keeps the average of price of fruit and vegetables quite low - at 1.5 Kina/kg and 1.13 Kina/kg respectively. However, local markets still deliver substantial cash incomes.

In two pilot studies of small farmers cash crops in Madang and Oro Province (in 2004 and 2005) I asked about their crops and their market income. While it is not possible to say that these pilots are representative for their regions, a few important observations can be made.

1. Virtually all small farming families (almost all on their own land) relied on cash income from markets, and marketed a mixture of crops for domestic and export markets.
2. Cash income from crops varied widely (some families also had outside work), from several hundred to several thousand Kina per year per family. The median cash income, was 3,000 and 4,200 Kina, for the Oro and Madang pilot groups, respectively.
3. Most families had one hectare or less under cultivation, though some worked up to 2 hectares, and many oil palm farmers worked up to 4 or 6 hectares. The oil palm farmers had to tend subsistence gardens, on top of their oil palm trees.
4. Those engaged in the oil palm industry had good medium incomes (see Appendix Table 4), though not the highest incomes of the two groups. The oil palm area seemed to be associated with lower general diversity of crops marketed (Anderson 2006).
5. The highest income earning families (some earned up to 16,000 Kina per year) were those farmers who focused on two or three crops for the domestic markets (typically peanut, betel nut and fruits) plus a couple of export crops, which could be companion planted (such as cocoa, coconut and vanilla) (Anderson 2006).

Given limited family landholdings, the leasing of productive agricultural land will reduce cash crop production and is likely to constrain subsistence production. To what extent this occurs depends on a number of factors, not least of which is what extent of land the family owns, and what proportion of it they choose to lease. For the purpose of this exercise it is sufficient to say that the leasing of customary land will compromise, in some proportion,

combined subsistence and cash crop production. The model in Appendix Table 5 (and calculated from the previous four tables) suggests an average minimum 'income equivalent' of 17,000 Kina per year per family. If half this income equivalent production were compromised, a minimum of 8,500 Kina per year would be required to compensate for lost basic food, housing and cash crop capacities. If a quarter of this production were compromised, 4,250 Kina would be required to compensate - and so on.

These are conservative estimates, which do not take into account a range of other benefits (some mentioned above) that accrue from the holding of customary land. Any variant of these figures is impossible to reconcile with the current rural lease rents of 20 to 100 Kina (the latter including royalties) per year.

#### **4. Valuation can inform registration**

The historical experience of land registration in Africa does not support the current arguments for land registration in PNG. In particular, the precedents look bad for promises of rural credit, greater security of title and greater agricultural productivity. Further, evidence on the existing value of subsistence and cash crop production, particularly when compared with the current value of land leases, suggests a great undervaluation of customary land is taking place. It seems that the PNG Government, in its role as protector of the interests of customary owners (through the lease-lease-back system) is failing in its responsibilities by allowing such extraordinarily low rural rents.

However the role of the state is not made easier with the combined forces of banks, mining and logging companies, aid agencies and western academics joining in the chorus for land registration. Commenting on an earlier version of my subsistence value calculations, though not questioning any particular detail, Curtin and Lea (2006: 172) express incredulity that customary land could be delivering many thousands of Kina in present value to its owners. They do not believe that PNG landowners "would sell themselves short" in land markets, where rents are as low as 20 Kina per hectare. They correctly note that a minimum sale figure for a hectare of land, adding up opportunity costs over many decades, would be very high indeed. But that is the point: land is so valuable as to be really priceless, as PNG customary owners have repeated many times. The point of land value calculations here has been to point to the inadequacy of market compensation, not to indicate a practical price that might encourage transactions.

Some time back, Bernard Narakobi wrote: "because land is eternal, it is held in trust for succeeding generations" (Narakobi 1988: 8). Indeed, it is the inter-generational value of land that renders all such calculations inadequate, and helps draw our attention to the danger for communities in converting such a precious and potentially sustainable asset into a small amount of short term cash.

It seems to me the historical record, and current valuation evidence, places a strong onus on the advocates of land registration in Papua New Guinea to address these questions:

1. Why should customary owners not see land registration and its associated promises as a step towards the dispossession of indigenous peoples, the purpose for which it was explicitly designed in the colonial period?

2. Why should PNG not have proper regard to the lessons of registration in colonial and post-colonial Africa?
3. How could registration possibly keep pace with family changes (adoption, migration, births and deaths) in the way that customary law now does? Is it not a certainty that many thousands of people will be left out of registers, due to the inability of the registers to be updated regularly and rapidly?
4. How could the formal dispossession of women be prevented if and when registration takes place, and entrenches the names of male clan leaders in patrilineal areas?
5. What can justify such low valued rural leases (20-100 Kina per hectare per year), when the value of domestic cash crops on such land can easily amount to thousands of Kina and the value of subsistence food and housing is many thousands of Kina?

## References

- ADB (2004) *Swimming Against the Tide? An Assessment of the Private Sector in the Pacific Islands*, Asian Development Bank, Manila
- Allen, Matthew G. (2000) 'Subsistence or cash cropping? Food Security on Malo Island, Vanuatu' in R.M. Bourke, M.G. Allen and J.G. Salisbury (2000) *Food Security for Papua New Guinea*, Proceedings of the Papua New Guinea Food and Nutrition 2000 Conference, PNG University of Technology, Lae, 26-30 June
- Anderson, Tim (2006) 'On the economic value of customary land in Papua New Guinea', *Pacific Economic Bulletin*, Volume 21 Number 1 (2006), online: <http://peb.anu.edu.au/pdf/PEB21-1Anderson-focus.pdf>
- AusAID (2000) Improving Access to Land and Enhancing the Security of Land Rights: a review of land titling and land administration projects, Quality Assurance Series No 20, September, AusAID, Canberra
- Bourke, R. Michael and V. Vlassak (2004) *Estimates of Food Crop Production in Papua New Guinea*, Australian National University, Canberra
- Bourke, R. Michael (2005) 'Agricultural Production and Customary Land in Papua New Guinea', in Jim Fingleton (Ed) (2005) *Privatising Land in the Pacific*, Discussion Paper Number 80, The Australian Institute, Canberra, June
- Bourke, R.M.; C. Camarotto; E.J. D'Souza; K. Nema; T.N. Tarepe; and S. Woodhouse (2004) *Production Patterns of 180 Economic Crops in Papua New Guinea*, Coombs Academic Publishing, Australian National University, Canberra
- Buno (2004) interview with this writer, Pikosa Village, Eastern Highlands Province, 7 December
- Burnett, Duncan & Dennis Ellingsen (2001) Review of the Oil Palm Fresh Fruit Bunch Pricing Formula, Final Report prepared for the Commodities Working Group of the Government of PNG, National Resources Institute and ADS (PNG), Port Moresby, November
- Burns, Tony, Bob Eddington, Chris Grant & Ian Lloyd (1996) 'Land Titling Experience in Asia', paper at International Conference on Land Tenure and Administration, Orlando Florida, November
- Callick, Rowan (2005) 'Resource Issues as a Source of Conflict', *Pacific Economic Bulletin*, Vol 20 No 1, May
- CELCOR (2002) *Para-legal Training Manual*, Centre for Environmental Law and Community Rights, Port Moresby
- Chitoo, John (2004) Interview with this writer, Madang, 14 December
- Cotula, Lorenzo, Camilla Toulmin & Ced Hesse (2004) Land tenure and Administration in Africa: lessons of experience and emerging issues, International Institute for Environment and Development, London

- Curtin, Tim and David Lea (2006) 'Land titling and socioeconomic development in the South Pacific, *Pacific Economic Bulletin*, Vol 21 No 1, 153-180
- Deininger, Klaus (2003) Land Policies for Growth and Policy Reduction, World Bank Policy Research Report, Oxford University Press and the World Bank, Washington
- Dickerman, Carol; Grenville Barnes, John W. Bruce, Joy K. Green, Greg Myers, Richard Polishuk, Douglas Stienbarger, and Andrew Sund (1989) *Security of Tenure and Land Registration in Africa: Literature Review and Synthesis*, Land Tenure Centre, University of Wisconsin-Madison, Madison USA
- DTI (2001) *Statistical Digest 2000*, Department of Trade and Industry, Papua New Guinea, July 2001, Port Moresby
- Embassy of Papua New Guinea (2004) Papua New Guinea, Embassy of Papua New Guinea to the Americas, Washington, <http://www.pngembassy.org/infrastructure.html#6>
- Esposito, Antonio (2003) 'A comparison of the Australian ('Torrens') system of land registration of 1858 and the law of Hamburg in the 1850s', *Australian Journal of Legal History*, [2003] AJLH 13, <http://www.austlii.edu.au/au/journals/AJLH/2003/13.html#fn3>
- Fingleton, J., 2004. 'Is Papua New Guinea Viable Without Customary Land Groups?' *Pacific Economic Bulletin* 19(2): 96-103.
- Forum Secretariat (2000) *Forum Regional Security Committee Outcomes*, Apia, Samoa, 10-11 August
- FPDC (2002) *Fresh Produce News*, Edition 162, September/October, 'Urban market prices', Fresh Produce Development Corporation, Goroka
- FPDC (2004) 'Total marketed fruit and vegetable demand 1995', Demand calculation based on 1995 survey and population growth figures, Fresh Produce Development Corporation, Goroka, unpublished table, Table 1c
- George, Henry (1979) *Progress and Poverty*, Robert Schalkenbach Foundation, Centenary edition, New York [first published 1879]
- Gibson, John (2000) 'The Economic and Nutritional Importance of Household Food Production in PNG', in R.M. Bourke, M.G. Allen and J.G. Salisbury (2000) *Food Security for Papua New Guinea*, Proceedings of the Papua New Guinea Food and Nutrition 2000 Conference, PNG University of Technology, Lae, 26-30 June
- Gou and Higaturu (1999) Agricultural lease between Gou Development Corporation (Oro Province) and Higaturu Oil Palms, September, Port Moresby
- Gunn, Bernard (2004) interview with this writer, Goroka, 9 December [Bernard is Director of the Community Based Health and Development Cooperative, at Kiam in the Western Highlands]
- Healey, C.J. (1986). "Dependence and development in the Jimi Valley." *Research in Melanesia* 10: 12-35.
- Heropa Enterprise (1999) 'Heropa Mini Oilpalm Estate: terms and conditions', negotiating document, Popondetta
- Hevari, John (2005) Letter to lawyers at CELCOR, Centre for Environmental Law and Community Rights, 17 July
- Higaturu (2003) Payment printouts for Heropa Estate, March & April
- Holstein, Lynn (1996) 'Towards Best Practice from World Bank experience in land titling and registration', World Bank, Washington, October
- Hughes, Helen (2004) 'The Pacific is Viable!', Issue Analysis No 53, Centre for Independent Studies, Sydney [www.cis.org.au](http://www.cis.org.au)
- Kaputin, William (1974) 'Indefeasibility and Justice' in Sack (Ed) (1974) *Problems of Choice - Land Law in PNG*, Australian National University, Canberra
- Kasas, Galum (2003) 'Promoting Trade and Investment Opportunities', Advertisement, *The Independent: Madang Supplement*, 27 February, p.3
- King, Graham (2001) 'Letter to The Chairman, Heropa Land Group, Ango Village, Oro Bay, from Higaturu Oil Palms (Pacific Rim Plantations Ltd), 23 March [Graham King was Field manager, Expansion for HOP]
- Koczberski, G., G. Curry and K. Gibson (2001) Improving Productivity of the Smallholder Oil Palm Sector in Papua New Guinea: a socio-economic study of the Hoskins and Popondetta Schemes, Australian National University, Canberra, November
- Koja, Kenneth (2005) Interviews with this writer, Popondetta, August
- Lakau, Andrew A.L. (1994) 'Customary land tenure and economic development in PNG' in Ron Crocombe and Malama Meleisea (Eds) (1994) *Land Issues in the Pacific*, Institute of South Pacific Studies, University of the South Pacific, Suva
- Lawrence, J.C.D. (1970) 'The role of registration of title in the evolution of customary tenures and its effect on societies in Africa', paper at the Seminar on cadastre, Addis Ababa, UN Economic Commission for Africa
- Lea, David (2004) *Customary Land Tenure in Papua New Guinea: what does it really mean?*, National Research Institute, NRI Special Publication Number 35, Port Moresby

- Mara and others (1999) Lease of Land, between Anton Mara, Leo Mautu Bakani, Lucas Becho, Paul Kaumu, Thomas Malala and John Nomu, and the Independent State of Papua New Guinea, 23 November [concerning 777 hectares of land at Garu Village in West New Britain]
- Mazoyer, Marcel (2001) *Protecting Small Farmers and the Rural Poor in the Context of Globalization*, Report for the United Nations Food and Agriculture Organisation, Rome
- Mosco, Mark (2005) 'Customary Land Tenure and Agricultural Success: the Mekeo case', in Jim Fingeleton (Ed) (2005) *Privatising Land in the Pacific*, Discussion Paper Number 80, The Australian Institute, Canberra, June
- Narokobi, Bernard (1988) *Concept of Ownership in Melanesia*, Occasional Paper No 6, The Melanesian Institute, Goroka, 2nd printing 1999
- Okoth-Ogendo, H.W.O. (1986) 'The perils of land tenure reform', [paper at the workshop on land policy and agricultural countries, Gaborone, Botswana, 14-15 February 1982] in J.W. Arntzen, L.D. Ngcongco & S.D. Turner (1986) *Land Policy and Agriculture in Eastern and Southern Africa*, United Nations University Press, Tokyo
- Oruga, Thomas (2004) interview with this writer, Pikosa Village, Eastern Highlands Province, 7 December
- Paol, Yat (2004) Interview with this writer, Madang, 14 December [Yat was speaking as a community leader of Tokain village, and a community worker with the Madang based Bismarck Ramu Group]
- Papua (1917) 'Transfer of Land by Natives to the Crown' (Horata, Beliripa, Bengita, Tubatapa, Soi-iwa, Jove, Comberaba, Sagari, Ida, Sahuru, Zadocari, Zaurat Sogiri), 10 May, Port Moresby [colonial document setting out an exchange of an 'unoccupied' 8,280 acres of 'good agricultural land' along the Sambogo river for goods to the value of 'one hundred pounds, eighteen shillings and sixpence'; the goods were said to comprise tobacco, axes, knives and matches]
- PIFS (2001) *Land Issues in the Pacific*, Pacific Islands Forum Secretariat, Suva, Fiji, August
- Powell J.M. (1976) 'Ethnobotany', in K. Paijmans (Ed) (1976) *New Guinea Vegetation*, Elsevier Scientific Publishing Company, Amsterdam & ANU Press, Canberra
- Rere, Steve (2004) interview with this writer, Goroka [Steve is an educator, author and former university lecturer in Agriculture]
- Reynolds, Henry (1987) *The Law of the Land*, Penguin, Melbourne
- Rusanen, Liisa (2005) 'In Whose Interests? The politics of land titling', Background Paper, AID/Watch, Sydney, May
- Rynkiewich, Michael (Ed) (2001) *Land and Churches in Melanesia: Issues and Contexts*, Melanesian Institute, Goroka (PNG), Point No 25
- Secretary for Lands and Physical Planning (1995) 'Brief: Sangara Crown land – Oro Province', brief to Minister for Lands and Physical Planning, Department of Lands and Physical Planning: Northern Region, July 25
- Sindana, Howard (2004) interview with this writer, Madang
- Sinemila, Grace (2004) Interview with this writer, Madang, 15 December [Grace was speaking as a member of Noromba village, WHP]
- Tararia, Almah (2003) Interview with this writer, Senior Lawyer, Environmental Law Centre, Port Moresby
- Thomas (2004) interview with this writer, Gauhuku Zuha Village, Eastern Highlands Province, 8 December
- UNDP (1999) *Papua New Guinea: Human Development Report 1998*, Office of National Planning, Government of Papua New Guinea and the United Nations Development Programme, Port Moresby
- Uni Tavor (2001) 'The Uni Tavor testimony', *Pacific Journalism Review*, 7: 1, pp.1-13, <http://www.asiapac.org.fj/PJR/issues/next/2001unitavur.pdf>
- Van Helden, Flip (1998) *Between Cash and Conviction: the social context of the Bismarck-Ramu Integrated Conservation and Conservation Project*, UNDP and National Research Institute, NRI Monograph 33, Port Moresby
- Yambai, Oiyoi (2003) Interview with this writer, Uriginia Village, Upper Ramu, March [Oiyoi is a member of the Ramu Valley Land Owners Association (RVLOA), and a traditional owner in LLG Ward 13]

<b>Appendix Table 1: Fruit and vegetable prices, Port Moresby, Goroka and Madang, Kina/kg, 2002*</b>				
	<b>Gordons (Port Moresby)</b>	<b>Goroka</b>	<b>Madang</b>	<b>Prices: POM/ Gor- Mad av.</b>
Sweet potato (Kaukau)	1.24	0.67	0.8	168%
Cabbage	2.87	0.98	0.65	350%
Tomato	2.64	1.2	2.06	162%
Carrot	7.01	2.02	2.21	331%
Broccoli	5.9	3.17	2.69	201%
Capsicum	6.41	4.77	4.63	136%
Aibika (greens)	1.02	1.68	1.38	67%
Banana (ripe)	2.21	0.77	0.82	276%
Pawpaw	1.79	0.47	0.65	320%
Coconut (green)	0.44	0.53	0.33	102%
Lemon/lime	4.54	0.74	2.06	324%
Mango	1.21	2.99	0.77	64%
<b>Unweighted average price ratio for 12 common vegetables/fruits</b>				<b>208%</b>
Source: FPDC 2002, pp.15-18, * October 2002 mean prices, largest volume traded items				

**Appendix Table 2: Estimates of the value equivalent of a typical daily family village diet from subsistence production (two adults and 4-5 children) - regional and capital market prices**

	Madang coastal		Madang inland ##		Highlands	
		Value equiv (mad/pom)		Value equiv (mad/pom)		Value equiv (gor/pom)
<b>Morning meal</b>	Cooking bananas, 3kg; Greens, ½kg	2.16+1.44/ 4.29+0.52	Cooking banana + taro (boiled or roasted); fruits (several), sago	2.16+1.60/ 4.29+3.80	Kaukau 1.5kg; local tea+sugar; **fried banana ½kg	1+0.50+0.60/1.8 6+0.50+0.90
<b>Daytime snacks</b>	Either pawpaw, ripe bananas or pineapple, 2kg; Coconut 3½*	1.60+1.32/ 3.80+1.54	Bananas, various fruits, nuts (galip, okari, peanuts), coconuts, & beetles	1.60+ 1.44+1.32?/ 3.80+2.10+1.54+?	Kaukau ½kg, one of bananas/pineapple/sugar cane/sugar fruit 1.5kg	0.33+1.20/ 0.62+3.00
<b>Evening meal</b>	Taro ½kg; kaukau 1kg; cooking bananas 1½kg; tomato ¼kg; onion ¼kg; carrots ¼kg ; plus some ginger/chillie/tumeric	0.36+0.80+1.08+0.5 2+0.83+0.55+1/ 1.10+1.24+2.15+0.6 6+0.75+1.75+1	Soup (greens, coconut, banana, taro), mix of banana/ casava/ yam/ kaukau/ tapioca, also tomato, onion, greens, various spices	1.44+0.80+1.08+0. 36+0.80+0.52+0.8 3+0.55+1/0.52+0.9 2+1.24+2.14+1.10 +0.66+0.75+1.75+ 1	Kaukau & banana 2kg; Greens 1kg; tomatoes ¼kg; onions ¼k; beans ½kg	1.50+0.98+0.30+ 0.32+0.65/2.60+ 1.05+0.66+2.50+ 3.40
<b>Weekly foods</b>	Either medium fish 1kg, ½ chicken OR ½kg pork (K5-10)	1.1/1.6	nil		Chicken ½, # Pig ¼ kg	1.3+0.4/2.5
<b>Monthly foods</b>	Bandicoot OR Tree Kangaroo (K10-20)	0.5/0.8 (equiv)	fish (4x year), chicken, goat and pig (2x year)	0.80+0.40+0.20/ 1.20+0.60+0.30	Cuscus - three times a year	n/a but 0.3/0.3 (equiv)
<b>Total daily equivalent value (Kina)</b>		<b>13.26 / 31.20</b>		<b>16.9/27.71</b>		<b>9.38 / 19.89</b>

Sources: Diet estimates and meat prices: Madang coastal (Paol 2004); Madang inland (Sindana 2004); Highlands (Sinemila 2004); Prices: Vegetables, at October 2002 prices in Gordon's (Port Moresby), Goroka and Madang markets (FPDC 2002); \*one coconut per person every second day; \*\* fried banana perhaps every third day; # Some pig might be shared once every two weeks, ## quantities estimated as for Madang coastal

**Appendix Table 3: December 2004 farmer survey, Madang**

Region	Prov	Gardens				Kina pa							Total	P7P	Supp?
		L/ha	HMW	HMF	%F	Buai	Cocoa	Coco.	Coffee	Vanilla	Other	Other*			
Raicoast	MAD	6	7	15+	75	1000	2000	500	0	1000	V,P,G,T	7000	11500	5360	nil
Aiome	MAD	1000	20	20+	100	2000	500	0	3000	not yet	M,V,P,B	500	6000	2100	DPI
aparamu	MOR	3	5	15+	85	2000	0	1500	0	not yet	P,M,B	12,000	15500	7200	nil
Amele	MAD	7	9	9+	75	5000	2000	300	0	5000		6000	18300	14200	WV
Tokain	MAD	3	7	15	75	2000	1400	2400	0	0		1000	6800	3170	nil
Bogia	MAD	2	8	8+	75+	100	100	0	0	450		0	650	570	nil
Raikos	MAD	300	30	30	na	500	0	2000	0	0		0	2500	580	nil
southkos	MAD	200	20	30	na	0	500	500	0	0		0	1000	230	nil
Baitabag	MAD	2	7	7	na	480	0	0	0	150		100	730	730	nil
Baitabag	MAD	1	na	na	65	150	0	0	0	0		70	220	na	nil
Gumine	SIM	3	2	5	60	0	0	0	90	0	Pineap	110	200	280	nil
aa	MAD	65	7	10	75	7300	0	0	0	2400		0	9700	6790	nil
Bogia	MAD	12	5	7	75	800	3000	0	0	0		0	3800	3800	nil
aparamu	MAD	20	7	15	85	3000	7000	1000	0	5000	P,B	20,000	36,000	16800	WV, DPI
aparamu	MAD	80	20	30	80	500	3000	100	0	320	P	5,000	8920	2080	WV, DAO
Saidor	MAD	1000	50	50+	90	3000	5000	4000	0	3,000	various	10,000	25,000	3,500	DPI, BRG
Transgo.	MAD	10	20	20+	75	2000	0	1000	0	not yet	P	20,000	23,000	8,050	Unitech st
E	SIM	2	5	50+	75	0	0	0	500	0	V,P	300	800	112	nil
cc	EHP	20	5+	10+	75+	0	0	0	400	0		0	400	280	na
<b>TOTALS</b>						<b>29,830</b>	<b>24,500</b>			<b>17,320</b>		<b>82,080</b>		<b>75,832</b>	
<b>AVERAGE</b>												Av of 18 -->		<b>4,213</b>	

V- vegetables

L/ha = land in hectares

DPI=Dept Primary Industry

(av of 18)

P=peanut

HMW= how many people work this farm?

WV=World Vision

G=greens

HMF= how many fed by this farm?

DAO=District Agric Officer \* peanuts were the biggest 'other' crop

T= tree crops

%F= what proportion of their food from farm?

BRG=Bismarck Ramu Group

B=brus/tobacco

P7P= annual income per 7 people (weighted family)

M=mustard

Supp?= support services

interviews in Madang, Dec 2004 - assistance from Howard Sindana



**Appendix Table 4: August-Sept 2005 farmer survey, Popondetta Plains (ORO)**

Region	Gardens				Kina pa (farm income)												
	L/ha	HMW	HMF	%F	Buai	Cocoa	Cocon	Coffee	Vanilla	P'nut	Oil Palm	Other	Other*	Emp	Total	P7P	OP?
1 Ahora	130	3	45	90%	0	0	0	0	0	0	0	F,V	1000	y	1,000	156	na
2 Sorovi	2	2	6	75%	0	0	0	0	new	0	6,000		0	n	6,000	7,000	LSS
3 Kakandetta	5		120	65%	0	B4	0	0	0	0	2,500		0	y	2,500	146	LSS
4 Sorovi	6	2	7	75%	0	0	0	0	0	0	6,000		0	y	6,000	6,000	LSS
5 Kakandetta	55	16	16	75%	new	0	new	0	new	0	7,800	Chkn	1200	n	9000	3937	VOP
6 Kakandetta	15	15	15	75%	0	0	0	0	new	0	15,000*	Chkn	900	n	15900	7420	LSS
7 Gona	18	8	23	90%	1000	0	0	0	new	0	3,300	F,V	2,750	yy	7050	2145	VOP
8 Sosoba	4	7	17	50%	400	0	0	0	new	0	15,000*		0	n	15400	6341	LSS
9 Aeka	15,000	10	50	90%	5,000	B4	B4	0	1,000	1,000	5,000		0	y	12000	1680	vop
10 Ahora	210	172	172	10%	300	0	550	0	0	0	7,800	F,V	500	n	9150	372	vop
11 Ahora	130	45	45	50%	500	new	1000	0	0	0	3,380	F,V	240	n	5120	796	vop
12 Gona	6	2	6	80%	750	0	0	0	new	0	2600	F,V	750	n	4100	4783	vop
13 Ahora	90	8	16	10%	500	0	750	0	new	0	4,550	F,V	1000	n	6800	2975	vop
14 Gona	10	2	5+	80%	1000	0	2,500	0	new	0	2,600	F,V	1,000	n	7100	9940	vop
15 Oro Bay	98	3?	14	80%	0	0	0	0	0	0	0	F,V,fs h	??	y	n/a	n/a	na
16 Ango	1000+	35	50+	90%	500	400	500	2400	new	0	0	F,V	500	y	4,300	602	na
17 Ango	1000+	50+	50+	90%	130	300	130	2400	new	0	new	F,V	260	y	3,220	450	not yet
18 Embogo	200	10	10	80%	new	new	0	0	new	0	0	F,V	1,750	n	1750	1225	na
19 Dombada	10	11	11	60%	200	0	600	0	0	0	0	F,V	1,200	y	2000	1272	na
20 Erora	1 or 2	2	5+	25%	350	0	250	0	0	0	0	F,V	450	yy	1,050	1470	na
21 Soravi	10+	20	30+	50%	0	0	0	0	0	0	7800	F,V	1,560	n	9,360	2184	LSS
<b>TOTALS</b>																	<b>60894</b>
<b>AVERAGE</b>																	<b>3045</b>
														Av of 20 -->			

LSS = land settlement scheme (leased land); VOP = village oil palm (customary land)

HMW= how many people work this farm?

HMF= how many fed by this farm?

%F= what proportion of their food from farm?

Interviews in Oro August 2005

L/ha = land in hectares

P7P= annual income per 7 people (weighted family)

Supp?= support services

Other = other farm income? (fruit, vege, chicken, fish)

Other\* = other non-farm income? (work, pension, business)

Emp = outside employment

<b>Appendix Table 5: Subsistence and cash crop values of customary land</b>				
<b>- per family, per annum, typical Kina or Kina equivalent -</b>				
	<b>cash income</b>	<b>subsistence value</b>	<b>employment income</b>	<b>total average income equivalent</b>
<b>subsistence</b>	av. 3,000 - 4,000	av 13,500	nil	17,000
<b>land alienation</b>	50 plus royalties	nil	2,000 to 10,000	6,050+
<b>supplementation</b>	av. 3,000 - 4,000	av. 13,500	av. 6,000	23,000
<b>Assumptions:</b> 1. average nuclear family of seven; 2. employment income for 'supplemented' group = one f/t job equivalent per family, at low to middle wage rates; 3. land alienation means 100% alienation				
<b>Sources:</b> Anderson 2006				