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MANGROVE RESOURCE MANAGEMENT IN A PACIFIC ISLAND NATION : FIJI

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ABSTRACT

For Fiji, an archipelagic nation of the several hundred islands with a coastal resource oriented population, mangrove areas are of crucial significance for national development. They provide a renewable supply of food, timber, fuel, dyes and drugs.

The history of mangrove resource management in Fiji is traced from pre-Contact times to the present. The differing perceptions of indigenous Fijians and of other, immigrant, communities are considered, particularly in terms of the effect of these differences on the administration and allocation of mangrove resources. An examination is made of the development of government policy, Colonial and post-Independence, on the mangrove ecosystem; shifts in this policy in relation to political pressures, and its present uncertainty. A multiple use approach to mangrove resource allocation and management is outlined, and that research which is considered necessary for its implementation is identified.

This informative case study of mangrove resource policy may, by comparison, generate new insights into mangrove resource management in Asian countries.

FIJI'S COASTAL ORIENTATION

Fiji is an archipelagic nation of roughly 400 islands. On a few islands there are some small inland population centres but most people live on or adjacent to the coast. The basic orientation of the nation is coastal. While sugar and gold are mainstays of the economy coastal tourism, and fishing, are supporting industries of growing importance.

The coastal ecosystems of Fiji are those shared with other island nations of the South Pacific region - coral reefs, seagrass beds and mangrove forests. The area of mangroves, variously estimated at between 19,700 and 50,000 ha (Richmond and Ackermann, 1975), is tiny by comparison with the vast tracts of mangrove throughout South-east Asia. Nevertheless, the local significance of the mangrove ecosystem, for a population of little more than 650,000, is very great - whether it is viewed as a source of useful products or as reclaimable land.

A HISTORY OF MANGROVE RESOURCE USE IN FIJI

Mangrove areas have long been appreciated in Fiji as sources of a variety of foods, construction materials, fuel, dyes and drugs. However, during the twentieth century, following on the introduction of new ideas on natural resource development there has been a tendency to relegate these natural values to a position of secondary importance.

The first of the new ideas for mangrove area utilization was conversion to agricultural soils. With the aid of newly introduced technology and skills 2,713 ha of productive sugar land was developed 70 years ago on the island of Vanua Levu through the conversion of the major portion of the mangrove deltas of the streams of the Labasa area from a self-sustaining multiple use resource to a mono-crop agricultural resource requiring continuing management inputs.

Elsewhere in Fiji during the first half of this century the remaining mangrove areas, while continuing to provide valuable supplies of food and other resources, were increasingly being used as sources of fuel for domestic and industrial purposes.

From 1933, when all mangrove forests were classified as Forest Reserves, the Department of Forestry had responsibility for controlling, by licence, cutting for fuel and structural timber. No provision had been made for the customary rights of indigenous Fijians. By the late 1930's there were frequent complaints from Fijians, coupled with demands by District Councils for village mangrove reserves - for house building materials in particular. The threat was greatest to the limited stands of *Bruguiera gymnorrhiza*, which was the preferred species for firewood.

However, the concept of village mangrove reserves as guaranteed sources of firewood and construction timber was eventually accepted - though not before a number of incidents of physical confrontation between villagers and licenced cutters in the 1940's had lent some urgency to the problem.

Early in the 1940's the system of licensing was overhauled and Divisional Working Plans, based on mangrove forest management principles developed by Watson (1928) in Malaya and applied by Marshall (n.d.) in Fiji, were prepared as bases for the issue of licenses. Village mangrove reserves were, in effect, established - by non-licensing of these areas. Ironically, having established these Working Plans as bases for fuel harvests (of several thousand tonnes of wood each year) industrial fuel demands began to decline markedly in the late 1950's. The availability and convenience of imported fuel oil had brought about the virtual disappearance of the mangrove fuel industry by the early 1960's.

The Forestry Department also administered, for a time, a system of

Temporary Occupation Licences which was designed to encourage small scale reclamation by individual farmers. Few, if any, of these small reclamations succeeded.

In 1955, however, a soil scientist had raised the possibility of further large scale conversions of mangrove areas to agricultural soils. During the 1960's interest in this idea grew, culminating in the initiation of projects at Navakai (1969), Raviravi (1971), and Rakiraki (1972), all of which were established in the context of a forceful reclamation policy outlined in Fiji's Development Plan Six (1971-1975).

The conflict between a push for expansion of agricultural lands and the growing awareness of the importance of mangroves as fisheries habitat was widely debated during the early 1970s - within Government and, through the press, by an increasingly concerned public. Some appeasement of the concerns of people with customary fishing rights in the Raviravi area was achieved by retaining a margin of mangroves seaward of the seawall protecting the reclamation. Within part of this seaward margin several fishponds were constructed for a pilot project in fish farming - an industry which has yet to be established in Fiji, in spite of the optimism of an assessment of fish pond prospects by Villaluz (1972).

Late in 1971, the then Ministry of Agriculture, Fisheries and Forests took an important initiative and convened a multidisciplinary meeting of professionals from Government and the University of the South Pacific. The objectives were a consideration of the broader view of mangrove resources and their development and, particularly, the initiation of long term monitoring studies to evaluate the consequences of the Raviravi project. This meeting ended indecisively and no monitoring studies were established (though soil chemistry analyses, a necessary adjunct of the reclamation process, continue).

Considering the debate of the early 1970s, then, the shift from a Development Plan Six (1971-1975) policy of large scale mangrove area reclamation to the cautious multiple use policy of Development Plan Seven (1976-80) was not unexpected. It called for:

> "No extensive reclamation of mangroves ... before the completion of a thorough survey of Fiji's mangrove resources provides a basis for fully assessing their value in social, environmental and economic terms ..."

This mangrove policy, for which Lands Department has responsibility, has been adhered to in spite of some moves by agricultural interests to subvert its intentions. However, numerous legal and illegal small scale impacts on mangrove areas continue to diminish their fisheries potential. These impacts result from cutting and from waste disposal, the latter probably generating an as yet unrecognised health hazard to

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consumers of marine foods taken from areas adjacent to rubbish tips or industrial waste outlets.

RECLAMATION FOR AGRICULTURE

In 1886 a Mr F.A. Velschow wrote, to the General Manager of the Colonial Sugar Refining Company (C.S.R.) at its Sydney head office, of prospects for the agricultural reclamation of Fiji's delta mangroves:

> " ... the soil of the Ba delta is exactly similar to soil of the Canton river delta in China, which consists of about 200 square miles of rice and sugar fields all below high water mark (HWM) and able to support a population of more than 2,000,000 people ...
>
> The fields of Demarara[1] are almost entirely below HWM, and I understand that the expense which has been connected with extracting the salt of the soil there has been highly repaid by the luxuriant produce of sugar obtained afterwards...
>
> I have no doubt that these Fiji deltas are more especially suitable for the cultivation of rice, but this circumstance only concerns the present question so far as to enable the sugar company eventually to sell these delta fields at a price to rice growers after the company, having first taken possession of them and by developing them, proved their high fertility ...
>
> Now it stands to reason that the fertility of these deltas is beyond doubt, and it is only a question of time when they shall be taken up for cultivation and thereby obtain a value which by far supersedes the value of all the rest of the ground in Fiji altogether, and I therefore believe I am justified in recommending the Company to take possession of these deltas at once, while they are lying entirely unregarded ..."

Before the close of the nineteenth century C.S.R. had responded to Velschow's enthusiasm by initiating mangrove reclamation projects in the delta of the Labasa River, where over 2,700 ha were converted for agriculture.

In terms of crop production, cash returns, foreign exchange earnings and employment the advantages of mangrove reclamation for agriculture are persuasive and easily understood. This is especially so when mangroves are viewed as waste swampland, unattractive to the eye and dangerous to the health. Thus, in terms of reclamation economics they have been viewed as having in their natural state a zero, or even negative, value. Any form of manipulation then can be made to look attractive.

Each reclamation has further reduced the nation's fisheries

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[1] Demarara is in contemporary Guyana

potential. Fiji's Lands Department, being responsible for the allocation of Crown (State) land, above and below water, faces a difficult task in trading off a possibly beneficial reclamation proposal against an increasingly urgent need to maintain an adequate fisheries base. A further convincing reason for caution on further reclamation is the importance of keeping open some development options for future decision makers faced with the demands of a national community whose interests may differ from those of today.

It cannot safety be assumed that current economic development efforts will, for all of those communities presently dependent to some degree on mangrove resources, generate sufficient cash to make possible the replacement of displaced mangrove food and fuel by commercial substitutes. The diversion of cash resources into substitute foods of low nutritional value, with a consequent decline in rural community health is, on present evidence, highly probable. The present ready availability of free seafood protein in many mangrove areas is crucially important for rural public health.

For indigenous Fijian communities with customary ownership of, or rights to, mangrove resources the possibility of malnutrition from depleted mangrove resources is coupled with a risk of cultural erosion. The loss of opportunities for such communities to live in a dependent relationship with mangrove forests means that certain traditional skills, technology and resource use concepts can no longer be applied.

Summarizing policy recommendations on reclamation, Baines (1979) stated:

> "... while reclamation can be a valid development option care needs to be taken to ensure, in any mangrove area, a balance between renewable and non-renewable uses. Mangrove area policy should aim to minimise erosion of the natural fisheries base and destruction of mangrove resource related indigenous culture. Also, it should embrace the idea of preservation of future development options and encourage the development of multiple resource use systems which take account of not only economic, but social, environmental and political factors".

MANGROVES FOR ENERGY SUPPLIES

Mangrove wood, for many centuries, has been harvested in Fiji for fuel and for building construction. Prior to the 1930's any consequent disturbance to mangrove ecosystems and their other natural values was slight. Then, over a 30 year period, mangrove fuel was exploited for small scale industrial purposes. This mangrove resource development option was described in a Legislative Council Paper (1950) in amusingly Victorian terms:

> "Fiji depends, as does two-thirds of mankind, for its solid fuel on firewood. The mangrove salt water swamp forests are like an inexhaustable coal mine in which the miners work not underground but in the sunlight and in which the crop properly managed renews itself every 40 years."

This had a significant impact on some of the nation's mangrove areas and there was extensive village community opposition to industrial scale fuel harvesting at the time. Both food and timber resources were seen to be threatened.

Bearing in mind those developments, and the continuing and expanding food, fuel and structural timber requirements of rural populations, Fijian and non-Fijian, it has been disturbing to note a resurgence of interest in industrial-scale extraction of mangrove fuel. A 1977 scheme for the possible use of mangrove wood to fuel a one megawatt thermal power station was soon dropped. Nevertheless, a later proposal called for the use of mangrove wood from the Rewa delta to satisfy the heating requirements of a Suva factory. This would have replaced imports of over 25,000 tonnes of coal each year, thus making a useful contribution to the effort to reduce foreign exchange outgoings. However it would have required, each year, the removal of between 1,000 and 2,000 hectares of mangroves - a significant proportion of the mangroves of the Rewa delta.

Industrial scale use of mangroves for fuel in Fiji is socially, politically and environmentally unrealistic. Fiji's mangroves are not great in area; even a small industrial fuel supply project would markedly diminish fisheries and local wood supplies, with inevitable social upsets and political reaction.

However, the use of some mangrove forests for rural domestic fuel requirements should be reconsidered. At present the approach to mangrove fuel harvesting is haphazard. Further research is needed as a basis for the improvement of multiple use systems for mangrove wood and food resources for rural domestic use. Import substitution at this level would be socially more meaningful than in the case of industrial fuel and could also make a significant contribution to foreign exchange savings.

PLACES FOR WASTE

Those in Fiji who subscribe to the "wasteland" concept of mangroves are quick to see value in the idea of using mangrove ecosystems as places for waste. The wasteland philosophy has encouraged local governments to site rubbish dumps among the trees of mangrove forests - with a potential bonus, where such dumps can be used as a basis for reclamation.

The proud and beautiful capital city of Suva is blighted by a poorly controlled dump in mangroves close to its centre. Here, the idea of using solid waste as a basis for reclamation for an expanding urban centre hemmed in by mountainous terrain is basically sound; an example of a valid development "trade off" against the mangrove ecosystem. However, such a waste disposal area needs to be much more carefully planned and managed, else serious community health problems may ensue - from the creation of opportunities for disease carriers or from the release of dangerous chemicals into adjacent waters which, in this case, are still extensively fished.

On the basis fo studies in Fiji, Nedwell (1974) proposed that the denitrifying potential of mangrove sediment bacteria be exploited to provide tertiary treatment for treated sewage effluent. This idea has been pursued in Fiji, where oxidation ponds for the treatment of liquid domestic (and some industrial) wastes have been constructed at two sites.

Nevertheless mangrove oxidation pond management, though practised elsewhere (e.g. Australia, Indonesia), is still imperfect. The technology is not completely free of problems or of health hazards, and the Fijian projects need to be carefully monitored for performance and for environmental effects.

There is concern, also, about liquid wastes from light industrial areas which may include environmentally troublesome chemicals such as heavy metals. While various legislative, administrative and technological devices might be used to minimise the risks of mangrove ecosystem pollution by industrial chemicals the only sure approach to this problem in Fiji is guided industrial development - the encouragement of industries which do not use or produce hazardous substances.

PERCEPTIONS, POLICY AND POLITICS

The goal of balanced allocation of mangrove resources, and effective management of these, requires not only ecological knowledge but an understanding of how people perceive these resources and how they interact with the associated environment.

Fiji is a plural society, about 48% of which is made up of an indigenous Fijian community. A further 51% of the population is composed of descendents of immigrants from India. In considering mangrove resource perception one must consider not only the differences which might be expected between these two ethnic groups, but also the environmental perceptions and legal concepts of the British colonial administration which preceded Independence in 1970.

To the indigenous Fijian, land, and all that grows upon it,

together with the people who draw their sustenance from that land, are one and indivisible. Adjacent mangrove and coral reef ecosystems are seen as integral components of that land, not as distinct entities conceptually separated from terrestrial ecosystems by an upper tidal water level. This comprehensive, ecological sensible concept of man-resources interdependence is implicit in a Fijian word, *vanua*.

In Fiji this enlightened perception of resources persists. However, it is at odds with British tidal law, which has prevailed in Fiji for over one hundred years and which is based on a perception of coastal resources which developed under the very different social and environmental circumstances of ancient England.

The European colonists saw mangrove areas as "wasteland", a jaundiced view which may have stemmed at least partly from the physical and mental privations which they suffered in attempting to adapt to life on mangrove dominated coasts. To a large extent this view, imposed on the people of Fiji, persists in urban thinking.

According to British tidal law the legal status of terrestrial land may differ from that of intertidal and submerged land. At its seaward extent terrestrial land is delimited by a boundary whose position is determined by the mean level of high tides, the mean high water mark (MHWM). Some components of Fiji's mangrove ecosystems - shrub formations of *Rhizophora stylosa*, for example, or *Acrostichum aureum* stands - are located largely or wholly landwards of MHWM. This level and its accompanying legal distinctions are ecologically inappropriate, even when it may be practicable to locate MHWM within the physically daunting environment of a mangrove forest.

Provisions for ownership of terrestrial land differ from those for intertidal and submerged land. Terrestrial land may be owned by the State (Crown Land), by individuals (Freehold) or by groups of indigenous Fijians (Native Land). All intertidal and submerged land is owned by the State and, here, indigenous Fijians have special customary rights to the use of the area's living resources. Among mangroves, then, customary rights apply to the crab *Scylla serrata* taken from tidal channels but do not apply to the mangrove lobster, *Thalassina anomala*, where it is taken from areas above MHWM.

Generally speaking, the rural Indian community of Fiji perceives the mangrove ecosystem as an important source of food and fuel and, thus, is likely to be as concerned as are indigenous Fijians about managing this ecosystem in such a way as will ensure sustained yields. Yet there is a very important difference in the attitude of the Indian community towards the reclamation of mangrove areas. This difference stems from the fact that 83% of Fiji's land, classified as Native Land, is available to non-Fijians only where this land is not needed for immediate use by its communal owners and, then only on a leasehold basis. There is an acute shortage of agricultural land for

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Indian farmers. Land reclaimed below MHWM is State-owned and can be leased on terms considered to be more secure than those associated with leases of Native Land: hence the enthusiasm for converting mangrove sediments to agricultural soils.

This difference in perception is reflected in local politics. Pressure has been applied by Indian-based political groups in attempts to have more mangrove land reclaimed for agriculture. Yet any proposal to alter an area of mangroves generates concern among Fijians about the effect of this on their fishing and on their customary fishing rights. A procedure for the payment of recompense for customary fishing rights lost as a result of coastal development projects was instituted in 1974. This has at least eased the situation.

In Fiji, where there are such marked differences in community attitudes towards the mangrove ecosystem, where reclamation has political implications and there an introduced legal system is at variance with the resource perceptions and traditions of the indigenous community, it is not easy task to formulate a national policy for mangrove resource use.

MANGROVE RESOURCE ALLOCATION FOR NATIONAL DEVELOPMENT

Past and present uses of Fiji's mangrove resources have been outlined in this paper, with reference to associated policies and administrative arrangements. Community perceptions have been considered as they affect attitudes of these resources and consequent political pressures for their reclamation for agriculture or their protection as fisheries resource base. The case for retention of mangroves for their contribution to fisheries is well known (see for example, Heald and Odum, 1970) and has not been elaborated here. The use of mangrove areas for purposes which are, to varying degrees, inimical to their role as fisheries resource base has been discussed here in terms of reclamation, energy supplies and waste disposal.

The divergences of community opinion about those development options, and the politically emotive nature of the land availability issue make the formulation of generally acceptable national policy a particularly difficult and frustrating task. How, then, should mangrove resources be allocated? Development Plan Seven (1976-80) proposed a survey of the nation's mangrove resources as a basis for assessing their value, in economic and non-economic terms. This could be used as a basis for allocation within the framework of a general policy of restraint on modification of mangrove areas. In other words, the nation's mangroves could be regarded as "resource reserves". Provision could then be made for "development zones" within which each development proposal would be subject to environmental assessment.

However, limited knowledge of Fiji's mangroves, together with

deficiencies in general understanding of the structure and function of the mangrove ecosystem, and the absence of effective methods for classifying mangrove areas in management terms, mean that this approach to resource allocation is not yet practicable.

In the absence of the preferred basis for mangrove resource allocation, decisions will still be made. And, unless there is an interim allocation policy, decision-making may be distorted by the pressures of sectoral interests preoccupied with short-term production targets.

On the basis of ecological and sociological realities and development trends in Fiji, Baines (1979), as Environmental Management Adviser to the Government, proposed the following:

> "First, *a basic policy statement* which recognises that mangrove areas, as they are, contribute in a number of important ways to national development; that, fundamentally, they are a fisheries resource base. Thus, proposals for mangrove area manipulation (and more especially those which require the elimination of mangroves) will be very carefully considered in terms of their expected benefits in relation to corresponding losses in the mangrove resource base.
>
> The *interim policy* would include the following points:
>
> - No reclamation for agriculture (the existing Development Plan Seven moratorium to be continued while more comprehensive studies are made of existing agricultural reclamations);
>
> - A system of mangrove resource management zones, perhaps incorporating village mangrove reserves and making provision for the domestic requirements of non-Fijian communities;
>
> - No cutting licences to be issued for the cutting of mature *Bruguiera gymnorrhiza*, a particularly valuable and threatened mangrove forest type;
>
> - No proposals for industrial scale exploitation of mangrove wood to be entertained;
>
> - Developers, including government agencies, to be required to design, construct and manage projects so as to prevent disturbance to adjacent mangrove areas from liquid and solid wastes and from obstruction of water exchange;
>
> - Prompt action to be taken to stop illegal disruption of mangrove resources and, where feasible, to require amends to be made through replanting.

- Tourism resort developers to be dissuaded from reclamation of any mangrove area adjacent to their landholdings but encouraged to "feature" these areas, perhaps with some slight alteration, as nature or fisheries reserves for the benefit of tourists and the public.

- Support for a programme of research into the nature and management of mangrove resources;

- Public education on the importance of mangrove resources for national development."

This interim policy proposal was supported by policy recommendations for specific areas of Fiji, which included all areas experiencing significant impact from reclamation, cutting and pollution.

Finally, recommendations were made on areas of mangrove resource research which would be most useful for mangrove resource allocation and management in Fiji:

- the ecology and physiology of mangrove food species;
- mangrove ecosystem processes - nutrient cycling, food chains and food webs;
- primary productivity as a guide to the productivity of associated food species;
- fisheries productivity of large mangrove estuaries;
- sustainable yields of such mangrove ecosystem components as wood and crustaceans;
- technology for the exploitation of mangrove food resources - the selection, improvement and application of effective indigenous and imported technology;
- mapping, zoning and classification systems;
- multiple resource use systems and their management;
- chemistry and physics of mangrove sediments, with particular reference to their suitability for soils, fish ponds;
- chemical, microbiological and heavy metal studies of sewage in mangrove areas;
- establishment, growth and regeneration of mangrove forests.

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