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# **RESEARCH REPORTS IN THE ECONOMICS OF GIANT CLAM MARICULTURE**

**Working Paper No. 32**

**Institutional Factors and Giant Clam Culture  
and Conservation in the South Pacific:  
Observations from Fiji, Tonga and Western  
Samoa**

**by**

**Luca Tacconi and Clem Tisdell**

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**Luca Tacconi<sup>2</sup> and Clem Tisdell<sup>3</sup>**

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The technical feasibility of culturing giant clams for food and for restocking tropical reefs was established in an earlier ACIAR project. This project is studying the economics of giant clam mariculture, to determine the potential for an industry. Researchers will evaluate international trade statistics on giant clams, establish whether there is a substantial market for them and where the major overseas markets would be. They will determine the industry prospects for Australia, New Zealand and South Pacific countries, and which countries have property right factors that are most favourable for commercial-scale giant clam mariculture. Estimates will be made of production/cost functions intrinsic in both the nursery and growth phases of clam mariculture, with special attention to such factors as economies of scale and sensitivity of production levels to market prices.

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# **Institutional Factors and Giant Clam Culture and Conservation in the South Pacific: Observations from Fiji, Tonga and Western Samoa**

## **ABSTRACT**

The paper analyses the role of institutional factors in giant clam farming and conservation in the South Pacific. Institutions can be characterized as organisations and rules of the game. This distinction is adopted in the present report.

The development of a giant clam farming industry can be speeded up by Fisheries Divisions through entertaining collaborative relationships with the private sector and by providing it with information, for example, on giant clam farming methods. Fisheries Divisions can promote clam conservation, not only by re-stocking reefs and introducing regulations on clam export and collection, but also by stimulating the establishment of community resource management schemes based on the rich tradition of customary marine tenure found in the countries considered in this paper. This can result in a cheaper method of clam conservation than re-stocking and may also help in maintaining the traditional knowledge of the marine environments.

**Keywords:** Giant clam farming, South Pacific, Fisheries Division, giant clam export.

**JEL Classifications:** Q57, Q21, Q22

# **Institutional Factors and Giant Clam Culture and Conservation in the South Pacific: Observations from Fiji, Tonga and Western Samoa**

## **1. Introduction**

The implication of institutional factors for giant clam culture in the South Pacific has been analysed to some extent by Fairbairn (1991a). His analysis was limited to the relevance of customary marine tenure for the development of commercial large-scale giant clam farming. However, there is a broader range of institutions that have implications for (large and small-scale) giant clam farming and conservation.

The term institution is used in economic analysis with different meanings. Thus, it is appropriate to define its meaning as used in the present context. An institution has been defined as "a social organisation which, through operation of tradition, custom or legal constraint, tends to create durable and routinized patterns of behaviour" (Hodgson, 1988 p. 10). This definition encompasses the distinction made by Van Arkadie (1990) which is useful in the present analysis, between institutions as *organisations* and institutions as *rules of the game*. An *organisation* may be a government body (e.g. Fisheries Division), a producer's co-operative etc. To this category also belong traditional organisations such as a village council. The *rules of the game* regulate the functioning of a society (e.g. written and unwritten laws) or of organisations. These rules are important because they "channel the behaviour of people with respect to each other and their belongings, possessions and property" (Runge, 1984 p. 807). Agents follow certain forms of action that conform to accepted social behaviour because they might agree with it or because they might fear the penalties they would face in case of violation of the rules (Cf Schotter, 1981; Rawl, 1972).

This report will consider the role of organisations in clam farming and conservation, but particular attention will be devoted to the implications of the rules of the game for farming and conservation of giant clams.

## 2. Institutional Factors and Giant Clam Culture

The major emphasis of research into giant clam culture has been on the biology of clams, cultivation methods and assessment of the profitability of giant clam farming. However other factors will also influence the successful adoption of giant clam farming. The perception of the issues involved in giant clam culture and the actions of institutions such as Fisheries Divisions and private firms are two of these factors and are considered in the following section.

### 2.1 *Organisations and clam farming*

The importance of institutional arrangements for clam farming is exemplified by the case of Western Samoa<sup>1</sup>. A commercial giant clam farm was established by a private entrepreneur on Namu'a island. This was the only commercial farm existing in the three countries visited (i.e. Western Samoa, Fiji and Tonga). This development is partly due to the collaboration established between the private entrepreneur and the Samoan Fisheries Division. This collaboration started when the businessman (an experienced diver) collected some giant clams for the Fisheries Division to be used as broodstock. In return, the Fisheries Division provided clam seeds spawned by the Division itself. More seeds from overseas research stations were also introduced to the farm at different times. Collaboration also continued in the form of periodical visits to the farm by Fisheries Division staff and overseas researchers.

This collaboration seems to be one of the factors that could (have) lead Western Samoa (which does not receive direct foreign aid for research on giant clams) to be the first of the three South Pacific countries visited to produce giant clams on a commercial basis and with good prospects for export. In fact, as already mentioned by Tacconi and Tisdell (1992b), the Samoan commercial farm has received inquiries from a New Zealand company interested in importing giant clams.

The lesson from this experience is that collaboration between Fisheries Divisions and the private sector and information availability (e.g. on production methods) are important factors in hastening the process of development of the giant clam industry.

In this regard, the picture that emerged from interviews in Fiji and Tonga is somewhat

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<sup>1</sup> Fieldwork for this report was undertaken before cyclone Val struck Western Samoa. The implications of this fact for clam farming in these countries are not considered here.

controversial. In these countries, private entrepreneurs do not seem currently to have much information about giant clam farming. However, it was found that in both countries private companies could be interested in clam farming. In Tonga, one entrepreneur (a fish exporter) showed particular interest and noted that he was actively looking for an appropriate site. He pointed out that his business relations with local people (the customary owners of the reefs) could facilitate an agreement over the conditions for the establishment of an eventual venture (e.g. rent of reef or profit-sharing).

## 2.2 *Rules of the game and clam farming*

In the South Pacific, tenure rights (a *rules of the game*) over land and marine areas are often vested in the traditional (customary) owners. Present day tenure systems have not only evolved through adaptation of old, traditional systems, but have also been shaped by the colonial influence and by the post- colonial independent states. The complexity of these systems has been increased by creating an overlay of 'modern' and 'traditional' rules. This has at times increased the frequency of land disputes because of uncertainty about the ownership of land returned to local communities after a long period of colonial rule. Most importantly, the colonial era has left the people with a sense of suspicion towards state intervention on land matters. These issues have particular importance in relation to how the development of a clam farming or conservation project should be approached.

Multiple ownership, land disputes and fragmentation of land parcels are often cited as major obstacles to economic development. However, to understand the issues at stake it is helpful to take a look at the concept of development and at two different approaches to tenure issues. Development can be interpreted as qualitative, social development of individuals, groups and societies. In its quantitative aspect; development is usually considered by economists as meaning an increase in income and/or wealth (*economic development*). Economic development is therefore only one aspect of the broader concept of development.

While economists have analysed the implications of tenure systems for economic development, social scientists from other disciplines have looked at tenure rights from a broader perspective. Tenure systems are not just a component of the economic structure of a society but they are also an integral part of the social system of the specific society. In the Pacific "Rights to land are the focus of social identity, the hallmark of citizenship in the local community ... An islander with land has confidence, status and security" Crocombe (1987b, p. 374). It has also been noted, perhaps too optimistically, that "Independent Pacific Island

governments *accept* that these systems, being expression of social structure itself, are basic to the continued welfare of their societies" (Baines 1989, p. 273; our emphasis). However economic development initiatives undertaken by these governments often tend to disrupt traditional resource-management systems. Baines describes these as a "development dilemma which is crucial for the future of the people of the South Pacific Islands..." and asks "...Will serious efforts be made to adjust approaches to economic development so as to ease those disruptions ... which are eroding Pacific island societies themselves?" (ibid). This approach is startlingly in contrast with the orthodox economic approach that sees economic development as the only objective to be achieved and customary tenury rights as constraints on economic development. When the point of view that tenure systems are an integral part of the local value-system is adopted, the issue becomes one of pursuing forms of economic development consonant to those values, thus pursuing development in its broader sense.

While much work has been done in relation to land tenure systems and their implications for development, limited attention has been paid to the aspects of marine tenure systems. However, recent research seems to extend the social importance of land tenure rights to marine tenure rights. Concluding a study on the Solomon Islands, Hviding (1989, p. 27) states that "The sea is the people's source of much of what they need in terms of food and money, but it is also a source of history and identity."

Research on the implications of marine tenure systems for giant clam mariculture in Fiji, Tonga, Vanuatu and Western Samoa found that "customary marine tenure can be a significant constraint to the development of a major giant clam mariculture project" (Fairbairn, 1991a p. i). From his analysis, it appears that this is due to uncertainty over reef ownership rights. However Fairbairn (1991a) also recognised that if villagers can benefit from the project then an agreement between the 'project developer' and the customary owners of the reef may be reached.

Thus the obstacle to the development of a project is not the customary marine tenure system in itself but the *entitlements* to the benefits from such a project. It is not surprising that local people do not want to give away their use- rights to the reef without receiving any benefits in return. Uncertainty over rights to use a particular reef area can sometimes be a problem, but decision-making mechanisms are most often in place to resolve such disputes and resolution can normally be achieved if proper benefits are forthcoming.

### **3. The Role of Institutions in Giant Clam Conservation**

Farmed giant clams may be used for commercial purposes or to re-stock depleted reefs for conservation purposes. There is, however, the need to study the role that institutions might have in the conservation of giant clams. This is so for two reasons.

First, a conservationist measure such as the re-stocking of a reef may prove successful in a protected area or marine park, such as the Australian Great Barrier Reef, where poaching is quite unlikely. However, in the South Pacific countries where giant clam meat is an appreciated seafood, re-stocking of reefs without strengthening existing institutional arrangements or creating new ones where these are lacking is at best a dubious exercise, as overfishing might deplete the clam stocks once more. In this case, institutional arrangements have a complementary function to reef re-stocking.

The second reason to pay attention to institutional arrangements has more far-reaching implications. Reef re-stocking obviously presents a cost that has to be supported by the organisation undertaking the project. This cost should be compared to that of a programme designed to conserve giant clams through the adoption of resource-management rules. In this case, institutional arrangements would be a substitute for reef re-stocking.

The case for closer attention to institutional arrangements is reinforced by the following considerations. The viability of a re-stocking programme will depend on whether giant clam farming is economically viable and is actually undertaken in the country proposing to implement reef re-stocking. This is because:

- (a) there are economies of scale in the hatchery phase of clam farming (Tisdell et al., 1990); thus clam seeds cost will be higher if they are produced only for re-stocking purposes;
- (b) in developing countries where development needs may appear to be more important than conservation needs, maintaining clam farming purely for conservation purposes may not be politically viable. If clam farming is also a commercial activity, clam conservation could be accepted as a spin-off of commercial farming.

Another consideration is that if commercial farming is not viable at the small-scale level

(because it is not profitable or because it does not integrate well with villagers' livelihood strategies), an institutional programme for resource management could not only protect giant clams from local extinction, but could also eventually increase giant clams available for consumption and sale.

### *3.1 Government regulations on giant clams*

A ten-year ban on giant clam exports was introduced in Fiji in December 1988 in order to protect the dwindling stocks. There has not been any attempt to regulate domestic consumption. This might be due to the fact that domestic consumption is not perceived as a threat to the natural clam stock and/or because it is felt that such regulation could not be enforced.

The Government of Tonga has not introduced a ban on clam exports (there appears to be limited export taking place), but it is introducing a regulation on minimum size for giant clams to be collected. The sizes are as follows:

<i>T. maxima</i>	155mm
<i>T. squamosa</i>	180mm
<i>T. derasa</i>	260mm

Enforcing this regulation will prove to be extremely difficult without full co-operation of fisherfolk and of retailers. In fact, spot checks could be done at the local markets and in-shell clams measured. It would however be difficult to cover all the markets, e.g. village ones. Also, clam size cannot be directly measured when they are sold frozen in plastic bags. Furthermore, fisherfolk have the option of consuming undersized clams at home while selling legal-sized ones. The practice of consuming small-sized clams at home, in order to maximise economic returns from clam collection, is already adopted in Tonga (Tacconi and Tisdell, 1992a).

Western Samoa has not introduced any regulations on giant clam collection. But, due to the apparent heavy exploitation of clam stocks, the current FAO/UNDP marine resource management project might recommend a total ban on giant clam collection, even if it is believed that people will disregard the ban and continue to collect clams (Zann, pers. comm.).

From the above observations, it is evident that conservation measures would have a better probability of success if they involved local communities. The importance of the involvement

of traditional institutions in conservation has been stressed by several authors with specific reference to the South Pacific (e.g. Carew- Reid, 1990).

### 3.2 *Community resource management and giant clam conservation*

While it is clear that tribal societies have never reached the rates of exploitation of natural environments typical of modern societies, the actual deliberate conservationist spirit of traditional resource-management systems has been (and still is) an object of discussion. In fact, it has been argued that these systems have an embedded spirit of conservation<sup>2</sup> but recent research tends to show that this is not always the case. Traditional management systems may be successful in avoiding resources exploitation in some instances, but this is not due to their intrinsic conservationist spirit according to Hviding (1989).

Thus there will be instances where external intervention might be needed in order to initiate conservation measures. These initiatives should *whenever possible* build on already existing resource-management institutions. As already noted, this would increase the success rate of these interventions by decreasing the 'dissonance' (Bromley, 1986) between external goals and action and local values, beliefs and goals. Furthermore, building on existing resource-management systems can also be a low-cost and flexible approach (Cramb and Wills, 1990; Runge, 1986).

To understand how a community conservation programme for giant clams can be established, and the difficulties that will be faced, we will consider the status of giant clams as a resource, the property rights regime under which they can be managed and the complexities of a resource management system with reference to Western Samoa as a specific case.

"In contemporary Samoa, the system of property rights on reef and lagoon areas is characterised by state ownership (as part of the country's territorial and EEZ areas) and customary ownership of fishing rights on those waters. These fishing rights apply to customary fishing areas that villages have claimed since time immemorial and are well defined and demarcated." (Fairbairn, 1991b p. 15). He also reports that each single village may claim exclusive rights over the customary fishing grounds. Because of increased pressure on marine resources due to population growth and commercial fishing, the practice of allowing neighbouring villages to fish in the customary grounds is declining.

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<sup>2</sup> See Johannes (1978) and Polunin (1984) for opposing views on this topic in relation to marine environments.

The system of marine tenure rights found in Western Samoa approximates the system defined as common property regime (CPR) but some qualifications are needed. A CPR "will consist of a well-defined group of authorised users, a well-defined resource that the group will manage and use, and a set of institutional arrangements that define each of the above, as well as the rules of use of the resource in question. In addition to the rules of use, there will be rules for changing the rules of use" (Bromley, 1989 p. 871). This definition is inclusive of the two characteristics attributed by Feeny et al. (1990) to what they call communal property. These characteristics are "(a) the exclusion of other potential users, and (b) the regulation of use and users to ameliorate the problems associated with subtractability" (ibid, p. 5).

They also define "common property resources as a class of resources for which exclusion is difficult and joint use involves subtractability."<sup>3</sup> Defining a 'common property resource' in its physical connotation does not however make the analysis clearer and may instead lead to some confusion. In fact, Bromley (1989) stresses common-property resources do not exist as such, but only resources managed under a specific property regime, i.e. a resource managed under private property will be in that specific condition a private property resource.

In Western Samoa, the customary system allows each village to exclude other users from customary reef areas. Restrictions on resource use and users may be imposed by the fono (village council) or by the central government (Fairbairn, 1991b). If restrictions are imposed, this satisfies the characteristic of 'regulation of use and users'. Here, the qualification to be made is that while Bromley (1989) specify that the group will manage the resource, Fairbairn (1991b) contemplates the intervention of the central government. The extent of government intervention and eventual conflicting goals in resource management could tend to weaken common property management, but in Samoa local communities appear to be firmly in control of their resources (eg most villages with direct access to beaches charge an entrance fee to be paid by tourists and also by locals coming from other villages) and the government respects local community management.

The marine tenure systems, commonly found in Western Samoa, differ however from the CPR captured in the definition of Bromley's (1989) for one of the characteristics of the latter system is that a 'well defined resource' is the object of management. A customary reef area cannot be defined as a resource because a reef area hosts several different fish resources with specific biological characteristics. Thus, specific rules for the management of the different

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<sup>3</sup> Originally stated by Berkes et al. (1989, p. 11)

resources are required. The customary marine tenure systems commonly found in Western Samoa have therefore the necessary elements to become CPRs, but to actually establish a CPR each single village council has to deliberate on the rules for the management of the specific resources.

Giant clams are one of the species found within customary areas and which have been over-exploited. Stock assessment of giant clams have not been undertaken in Western Samoa. However, an indication of over-exploitation is the sharp drop registered in clams marketed at the daily Apia fish market. In 1986, the weight of in-shell clams marketed reached 10Mt, but in 1990 it had dropped to 0.1Mt (Food and Agricultural Organisation, 1990). To get a better understanding, although only from a qualitative point of view, of the situation of the stocks of clams and also of their status (e.g. institutional features), a rapid assessment was organised during fieldwork in Western Samoa. The areas and villages visited are the coastal villages of Upolu island presented on Map 1. These were selected on the basis of a list of villages whose inhabitants, according to market surveys conducted by the Fisheries Division, had sold clams at the Apia market in 1986.

The general picture that arises from semi-structured interviews with fisherfolk in the villages, is one of generalised stock depletion. Only in one village, Manonouta, did a group of villagers declare that they were still sporadically selling clams at the market. Collection for their own consumption had also markedly diminished due to a decline of the stock of clams. If the present trend continues, the two species of clams left in Western Samoa (*T. squamosa* and *T. maxima*) may soon follow *Hippopus hippopus* on the path to local extinction.

An example of how to proceed in clam conservation in Western Samoa, and also in other Pacific countries with the due adjustments to local conditions, is set by Salamumu village. The village, on the southern coast of Upolu island, has scattered houses along the road leading to the beach and reef area. Other private houses and meeting places stretch along the beach.

In 1988, the village council, formed by matais<sup>4</sup> (chiefs), passed a regulation (proposed by a matai who resides in New Zealand) establishing rules for the management of giant clams, thus changing their status from one of open access resource to one of common property

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<sup>4</sup> In Western Samoa the chieftainship system is still quite strong. The matais are however fairly representative of the general community needs, given that each family has a matai. In Western Samoa, approximately one person in ten is a matai

resource. This regulation stated that for three years:

- villagers cannot collect giant clams in order to sell them;
- villagers are allowed to collect clams for own consumption;
- a fine of Tala 50 was to be paid by those breaking the regulation.<sup>5</sup>

After the third year, collection for sale was allowed again because the number of giant clams on the reef appeared to be increased and also because people were in need of money to pay contributions to the church. A visit to the reef at low tide (water depth 40-50cm), with an experienced fisherman, did not however result in the sighting of clams. According to the fisherman 'it is easier to find the clams when the tide is lower'. A quantitative stock assessment would be needed to better assess the effectiveness of a community management scheme such as that of Salamumu. Nevertheless, the important point to be made here is that this community set in place a management plan that protected clams and this was done for a resource that is very marginal to the local economy. We do not have quantitative data on the contribution of giant clams to the local diet or to local incomes. However, data at the national level shows that giant clams are only a small portion of total seafood consumption (Tacconi and Tisdell, 1992c).

It has been hypothesised that the 'tragedy of the common' better describes the exploitation dynamics of a resource that is not vital than that of a resource that is (Kimber, 1983). In fact, when "survival is at stake, the rational individual will exercise restraint at some point." (Wade, 1987 p. 101). This proposition seems to apply to Western Samoa in general, where clam stocks have been depleted. However the relevant fact is that in Salamumu collective action was taken to protect a marginal resource. This might be explained as follows: Firstly, we have the 'stewardship' factor. In Western Samoa villagers see themselves as custodians of the reef and have the right and the obligation to manage their marine resources (Fairbairn, 1991b). This leads to the 'economic implementation' of the management rules. By definition a marginal resource carries limited economic benefits. The imposition of a relatively high penalty greatly reduces the incentives to break the rules. Also, in a cohesive community, the moral incentive to behave according to the rules is high. These two elements tend to reduce enforcement costs (e.g. policing) and thus facilitate the establishment of a resource management scheme.

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<sup>5</sup> At the time of the fieldwork the exchange rate was Tala/A\$ = 0.6.

Conservation plans similar to that of Salamumu could be promoted in other villages in Western Samoa as a cheap method to protect giant clam stocks. Because of the expected marginal importance of the clam resource in village economy, it would pay off to promote conservation awareness within a global program of environmental protection and not just address giant clam conservation. To be successful, management plans have to be adopted by the local communities as their own. Western Samoa is in an excellent position to promote these schemes because of the presence of fundamental characteristics needed for the success of these plans (see Wade, 1987), especially with regard to user groups and relationship between users and the state, are favourable.

One factor that could tend to slow down the process of community discussion and adoption of management plans is the impact of migration on the effectiveness of village councils in decision-making. In the village of Vailea during a group interview with three matais, it was pointed out that to deliberate on a management scheme, the village council had to call for a meeting of all the matais from the village. Because some matais were living overseas, the council had to wait to meet until all of those matais could be present. Given that migration is a common feature of Samoan villages, the implications of migration on local decision-making institutions should be considered as well as a more in- depth analysis of the relevance of this phenomenon for resource management.

#### **4. Conclusion**

Institutional features of economic and social systems tend to receive too little attention in development and conservation projects. Nevertheless, they play a relevant role in determining the success of such initiatives. It has been argued that accounting for the social significance of institutions such as customary tenure rights will enhance the consonance of development and conservation project with the local values, beliefs and goals.

Taking this approach need not hamper the economic viability of those projects. According to the specific economic conditions, institutional arrangements can be seen as either complementary or substitute for the project approach. In actual fact, proper institutional arrangements can reduce the cost of giant clam farming or conservation.

Pacific countries are rich in tradition of natural resources community management. Viewing this tradition as a resource to tap could not only improve policy decisions, but would help in

preserving the knowledge of the local natural environments. Conservation initiatives should not only be about preserving the natural environment, but it should also aim to preserve our knowledge of them.

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## **APPENDIX**

### **Persons met during fieldwork**

#### **FIJI**

Tim Adams	Acting Director, Fisheries Division
Esaroma Ledua	Fisheries Officer, Fisheries Division
Subodh Sharma	Fisheries Officer, Fisheries Division
Hamidan Bibi	Senior Fisheries Assistant, Fisheries Division
Jone Sogovale	Senior Fisheries Assistant, Fisheries Division
Apisai Sesewa	Senior Fisheries Assistant, Fisheries Division
Johnson Seeto	Director, Marine Institute, University of the South Pacific
Robert Gillet	Project Manager, UNDP

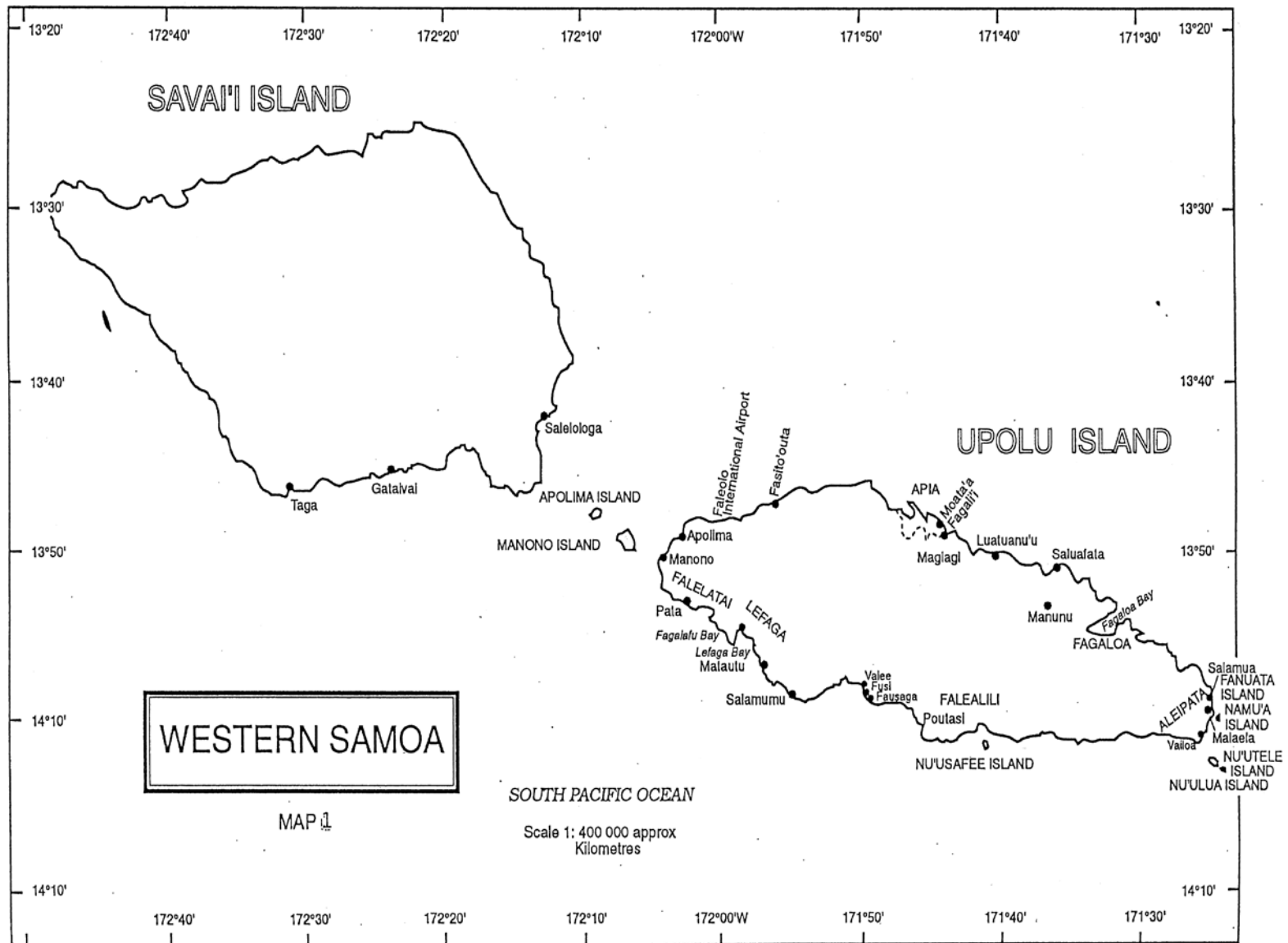
#### **TONGA**

Sione Mangisi	Director, Ministry of Fisheries
Taniela Koloa	Principal Fisheries Officer, Ministry of Fisheries
Ulunga Fa'anunu	Head of Aquaculture, Ministry of Fisheries
Naita Manu	Giant Clam Project Leader, Ministry of Fisheries
Tupou Tupou	Fisheries Assistant, Ministry of Fisheries

#### **WESTERN SAMOA**

Ueta Fa'asili	Chief Fisheries Officer, Fisheries Division
Leon Zann	Fisheries Resources Advisor, FAO/UNDP
Dan Su'a	Senior Marine Biologist, Fisheries Division
Ameto Kalolo	Fisheries Assistant, Fisheries Division

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### Previous Working Papers

1. "Market for Giant Clam Shells: Report on a Survey of Retailers and Wholesalers in Southeast Queensland, Australia." Clem Tisdell with the assistance of Rene Wittenberg, November, 1989.
2. "Seafarming as a Part of Indonesia's Economic Development Strategy - Seaweed and Giant Clam Mariculture as Cases." Carunia Firdausy and Clem Tisdell, November, 1989.
3. "Market for Giant Clams as Aquarium Specimens: Report on a Survey of Retailers of Supplies for Saltwater Aquariums, Southeast Queensland, Australia." Clem Tisdell with the assistance of Rene Wittenberg, November, 1989.
4. "Aquaculture as a Use of the Coastal Zone: Environmental and Economic Aspects, Giant Clam Farming as a Development." Clem Tisdell, December, 1989.
5. "Pacific Giant Clams and their Products: An Overview of Demand and Supply Factors." Clem Tisdell, December, 1989.
6. "Marine Property Rights in Relation to Giant Clam Mariculture in the Kingdom of Tonga." Dr T'eo I.J. Fairbairn, February, 1990.
7. "Exploring the Demand for Farmed Giant Clams and Their Components: Approaches and Problems." Clem Tisdell, February, 1990.
8. "Report on possible Demand for Giant Clam Meat by Tongan Descendants in Australia: Inferences from interviews conducted in the Brisbane Area". Clem Tisdell and Rene Wittenberg, February, 1990.
9. "Evaluation of International Trade Statistics on Giant Clams and Related Products and the Market for Giant Clam Meat." Dr John Stanton, March, 1990.
10. "Assessing Species for Mariculture in Developing Countries: A Review of Economic Considerations." Carunia Firdausy and Clem Tisdell, April, 1990.
11. "An Analysis of the Cost of Producing Giant Clam (*Tridacna gigas*) Seed in Australia." Tisdell, C.A., Lucas, J.S. and Thomas, W.R., May, 1990.
12. "Marine Property Rights Fiji: Implications for the Development of Giant Clam Mariculture." Dr T'eo I.J. Fairbairn, August, 1990.
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35. "Interest of Asian Restaurants in Queensland in Using Giant Clam Meat in their Cuisine and Their Knowledge of It." Clem Tisdell, September, 1992.
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