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Working Paper No.6

Marine Property Rights in Relation to Giant
Clam Mariculture in the Kingdom of Tonga

by

Teo I.J. Fairbairn

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MARICULTURE**

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**Marine Property Rights in Relation to Giant Clam
Mariculture in the Kingdom of Tonga¹**

by

Teo I.J. Fairbairn²

February, 1990

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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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Marine Property Rights in Relation to Giant Clam Mariculture in the Kingdom of Tonga

ABSTRACT

Marine property rights on the coastal waters of the Kingdom of Tonga are fairly uncomplicated. Ownership of Tonga's reefs, and lagoons (as well as its territorial waters as a whole) is vested in the Crown and has been so since the late 19th century. While such an arrangement effectively took away the traditional and customary rights of local groups over these waters, it allows open access to all Tongans for purposes of fishing, both subsistence and commercial. The main exceptions are certain restricted areas set aside as marine parks.

Leases over reef sites for giant clam and other forms of mariculture can be negotiated with government. The Fisheries Act of 1987 and the Fisheries Regulations of 1989 provide the basic legislative framework for such leases. Specific terms and conditions relating to leases are negotiated under the auspices of the Ministry of Agriculture, Forestry and Fisheries. Under existing legislation, the Minister of Agriculture, Forestry and Fisheries has fairly wide regulatory powers to ensure, among other things, that mariculture, and fisheries in general, proceed along sound lines. Tonga appears to possess many favourable features for giant clam mariculture. The country's many constituent and widely scattered islands support extensive reef and lagoon areas; the necessary legislative and tenurial framework is in place; while public awareness on the potential of clams as a major industry seem to be growing (Tonga's 'giant clam circle' project has contributed in this respect). The Ha'apai Group, with its large reef areas and generally favourable social environment, appears to be particularly well-placed to support a major clam project. For purposes of establishing a commercial clam project, including one with foreign participation, the collaboration of local groups seems to be a vital pre-requisite. The involvement of local villagers can be particularly valuable for the policing of project sites to prevent poaching. Collaboration with other local groups also seems necessary, for example, the Fishermens' Association and local government officials.

Keywords: Marine property rights, Kingdom of Tonga, giant clam mariculture, the Ha'apai Group

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Marine Property Rights in Relation to Giant Clam Mariculture in the Kingdom of Tonga

Reef and related coastal property rights in the Kingdom of Tonga are relatively straightforward. This situation stems from the fact that ownership of territorial waters (including inland waters) is vested in the Crown - an arrangement that goes back to a Royal Proclamation in the late 19th century and subsequently enshrined in formal legislation. Among other things, Crown ownership of Tonga's territorial waters effectively took away any customary rights the local tribal or community groups may have had over offshore fishing grounds. It also conferred on all Tongans a system of free access allowing them to fish anywhere in the Kingdom's territorial waters.

This paper reviews the system of reef property rights in Tonga and implications for the development of clam culture and other types of mariculture. It also examines customary forms of sharing arrangements and suggests possible approaches for successful mariculture developments in Tonga.

1. The Background

The Kingdom of Tonga is located in the central South Pacific region, 900km southwest of Western Samoa and 700km east of Fiji. The island group is widely scattered and contains a total of 171 islands of which only 37 are inhabited (see Map 1). Most of the islands are small, low-lying, coral atolls and only a few are of volcanic origin (with mountains reaching 900 meters). Tonga's land area total 700 km² but the sea area under its territorial waters amounts to 700,000 km².

Tonga's population is currently an estimated 96,000, of which 64,000 or 66 per cent, live on the main island of Tongatapu. Over recent years, Tonga's population has increased slowly largely because of heavy overseas migration, especially to New Zealand.

The economy is based on the production of coconut products for export (primarily coconut oil and desiccated coconut), bananas and a variety of agricultural and light industrial items. It also sustains a wide variety of products for domestic consumption, a large part of which is

produced under subsistence conditions. Major prospects for development are related to a more intensive utilization of land for agriculture, exploitation of marine resources and further development of tourism and light industries.

As is clear from Tonga's current Five Year Development Plan (Government of Tonga, 1987a), fisheries is one of the leading sectors for purposes of achieving increased production and economic growth. A more intense effort to develop Tonga's mariculture potential is implied in the principal development objective for fisheries, namely:

- increase production of fish and other marine products in order to maximize social and economic benefits for Tonga, having full regard for the biological constraints of maximum sustainable yield (Government of Tonga, 1987, p. 181).

The Plan goes on to identify several key measures for achieving increased fish production in both shallow waters (including reef and reef slopes) and pelagic zones. Such measures includes: a more active artisanal boat building program, an improved marketing system, an upgrading of the Fisheries Division (part of the Ministry of Agriculture, Fisheries and Forests) and greater encouragement of the private sector in further development. For its part the Fisheries Division focuses on several areas of fisheries development, notably the development of rural fisheries, low-technology commercial inshore fisheries, aquaculture research and other special services. Its rural fisheries work involves the development of boat building, training, technical advisory services and the establishment of ice plants and related facilities. The main areas of aquaculture work are: giant clams, oysters, seaweed culture and mullet culture, but in none of these areas are present development efforts very extensive.

In so far as the Fisheries Division's artisanal fisheries development work is concerned, specific objectives are laid out as follows

- to expand artisanal fishing by introducing new fishing craft and improving fishing techniques which together will help to improve the amount of fish supplied to local markets and for export.
- to reduce the pressure on traditional fishing grounds by diversification into unexploited species inshore and offshore areas beyond the current range of the artisanal fleet.

- to provide additional employment opportunities and to increase income from fishing activities particularly in the outer islands groups where marine resources are concentrated.

Particular opportunities and possibilities for developing Tonga's mariculture (and aquaculture) have been the subject of several recent expert studies. In 1988, FAO drew up a Master Plan for mariculture/aquaculture development, including prospects relating to giant clams, fish ponding and green mussels and a number of key proposals (e.g. training) contained in this plan are being considered for implementation. Tonga has also had the benefit of several technical studies on particular aspects of mariculture, for example, Chesher (1988) on the revitalization of giant clams in Tonga and Brayley (1989) on aspects of giant clam development (report not yet available).

In practice, mariculture in Tonga has made little headway. It is confined to fish trapping by means of fish fences which villagers have erected on reef areas. (There are presently around 50 such structures in the Kingdom). It also includes the establishing of so-called "clam circles" (see section below) as a means of reviving interest in clam culture, although this initiative is closely linked to government's efforts to: foster greater public awareness of environmental issues. Current mariculture experiments e.g. seaweed farming, being undertaken by the Fisheries Division, can also be noted.

Further opportunities for mariculture would seem to be considerable, especially given Tonga's archipelagic spreads and large reef area together with other natural advantages. The realization of such a potential calls for appropriate development measures - legal, tenurial, research etc - in both subsistence and commercial sectors. A major recent initiative is the enactment of new legislation - the Fisheries Act 1989 and the Fisheries Regulation 1989 - which, among other things, addresses the issue of property rights in relation to reef mariculture projects. On such projects, the legislation provides exclusive rights to the leased areas.

2. Reef property rights and traditional sharing arrangements

As noted earlier, ownership of Tonga's territorial waters (Tonga has not declared an EEZ) both sea and inland waters, is vested in the Crown. Tongan territorial boundaries were defined by Royal Proclamation (by King Geoge Tupou I) in 1887. According to this

proclamation Tonga's territorial boundaries were declared to include all islands, rocks, reefs, foreshores and water lying between the 15°00' and 23°30' South parallels and between 173°00' and 177°00' West Meridians. The Land Act of 1927 officially conferred on the Crown all land and sea areas within the Tongan territorial limits.

Fishing in Tonga's territorial waters is open to all Tongans. Villagers have no exclusive rights, either legal or customary, to particular areas of reef and lagoons. Fishing in these inshore waters, as is the case with pelagic waters, is open slather. Also, there is no restriction governing the kind of fish species Tongans can fish for within these waters. Anything is allowed.

Open access however, is restricted in two particular cases. The first relates to fishing activity on areas declared a natural marine park, which currently total 11 in all¹). These marine parks have been primarily established for environmental and fish conservation and exclude all commercial fishing but allow some subsistence activity.

The second case relates to reef areas surrounded by fish fences; here the rights of owners are recognized over a distance of one mile around the fish trap (but boat passage is allowed). Such structures operate under a licence which has to be secured annually from the department of Police at a cost of T\$10².

There are other special exceptions to free access. These include fishing rights on inshore lakes and rivers/streams which belong to the King. Also, the extensive waters of Fagauta Lagoon, south east of the main township and approximately 1,000 acres in size, is a protected area in the sense that commercial fishing is banned. This protected status was conferred upon Fagauta Lagoon by the Fisheries Act of 1976.

Territorial rights towards reef and lagoon areas that villagers apparently enjoyed in earlier times seem to have disappeared. On outer islands however, residual notions of territorial rights towards off shore waters still persist somewhat, but apparently have no practical impact. In practice of course, it is common to find villagers confining their fishing activities, especially in the case of subsistence fishing, to adjacent offshore reefs but it is not uncommon

¹ There are five such marine parks or reserves on Tongatapu (Hakaumama'o Reef Reserve, Pangaimotu Reef Reserve, Monuafe Island Park and Reef, Ha'atafu Beach Reserve and Malinoa Island Park and Reef Reserve), three on Vava'u; two on Ha'apai and one on Eua.

² The Tongan *Pa'ana* (T\$) is pegged at par to the Australian dollar which at the time of fieldwork was equal to US\$0.75.

for villagers to fish in one another's back yards, so to speak. In the case of small islands owned by a noble, fishing by outsiders is rare.

All fishing carried out commercially requires a permit from government. Fishing permits for Tongans can be obtained from the Department of Police and for foreign fishing ventures, from the Department of Inland Revenue. Foreign venture proposals, which have been primarily for pelagic fishing so far, have to be licenced by the Privy Council.

Leasing of reef areas for marine development and related purposes can be negotiated with government. Granting of a lease is dependent on the perceived merits of a project and since 1984, an impact assessment study is required as part of a project submission.

Sharing arrangements

Traditional fishing methods involving village groups and sharing arrangements are rarely practiced today in Tonga. Fishing is now largely a matter for individuals, immediate family members and groups working together with a boat and net. However, traditional forms of group fishing are still practised on outer islands where subsistence life remains strong, as seen on Vava'u and Ha'apai groups. Such surviving custom is seen in that of *toungaue* where villagers co-operate for purposes of fishing or carrying out other forms of work without monetary payment. Work is carried out with a view of reciprocation among members, and in the case of fishing, members of the work group share in the catch.

Another form of sharing activity is the *uloa*, or fish drives, which can involve up to two villages or as many as 30-40 villagers. Here, the participating villagers form a large circle while holding a simple net made from palm fronds attached to a rope. By pulling on the rope the fish are driven into a trap at one side of the circle. The catch is divided among the villagers, usually with a larger share going to the head fisherman and local chiefs.

A related form of group fishing is *velo*, a traditional fishing practice that can involve two or three villages. In this case, the participating villages form several concentric circles and drive the fish into a trap located at the centre of the innermost circle. Apparently this form of sharing arrangement is rarely practiced.

As noted above, ownership to Tonga's territorial waters including reefs and lagoons, is vested in the Crown. Apart from certain restricted areas, notably natural marine parks, such waters are effectively a common property within which all Tongans can enjoy the right to fish, both

commercially and for subsistence. A notable feature of this ownership pattern is the absence of traditional-based claims by local village groups on the fishing rights of their waters. By comparison with most other Pacific island countries, Tonga's system of reef tenure and fishing rights is uncomplicated. One advantage is that it gives Tongans complete freedom to fish anywhere in these waters, unfettered by customary or other restrictions. However, uncomplicated as it is, for purposes of maricultural development, the present system of reef tenure has two major weaknesses. The first relates to the need to establish extensive rights to reef and lagoon sites required for mariculture. Given Crown ownership, this requirement can be met by adequate leasing arrangements between government and the mariculture operators (see below).

A second aspect of the existing tenure system relates to the need for measures to protect areas under mariculture from outsiders, including poachers. For successful mariculture it is necessary to restrict access to the site of the operation. Legal framework for the protection of mariculture areas under lease is provided for under the Fisheries Act of 1987.

A related problem is the need to ensure effective policing of mariculture operations - a requirement that, in Tonga, appears to call for cooperation between government, the mariculture venture and the local community. Additionally, it calls for cooperation (and compliance) on the part of fishermen in general. Without such cooperation formal government regulations will have little effect.

The leasing of Crown land for aquaculture is provided for by the Fisheries Act noted above. Section 25 of the Act states that "government may lease areas, lagoons, the foreshores and sea-bed for the purpose of aquaculture" (Government of Tonga, 1987b, p.26). Such leases are awarded both to Tongan ventures and foreign investors, and the Act empowers the Minister responsible for fisheries (i.e. the Minister of Agriculture, Forestry and Fisheries) with the task of prescribing the terms and conditions of leases.

The same Minister is empowered under the Fisheries Act of 1987 (Government of Tonga 1987b) to control the licencing, regulation and management of particular areas, including aquaculture operations (see Part IV, Regulation 40 (2)(a)). Part of the Minister's regulatory functions refers to the question of entry into the areas leased for aquaculture purposes. Under Section 40 (2)(a) of the Act, the Minister is responsible for regulating or prohibiting the entry into leased land or to any "water superjacent to such land" (Government of Tonga, 1987b,

p.28).

It may also be noted that the Fisheries Act Section 22 (1) empowers the Minister to declare any area of fishery waters to be reserved for subsistence fishing and to stipulate the kind of fishing vessel and method of fishing that can be used in each area. Although the primary purpose of this part of the Act is to protect subsistence resources from commercial exploitation, such a provision may be useful in establishing reserve areas for subsistence orientated mariculture.

As noted above, formal measures are already in place for the leasing of reef areas for mariculture as well as the regulation and protection of mariculture operations. These legislative measures are backed up by the technical facilities of the Fisheries Division and other government agencies. This support relates particularly to such services as the demarcation of lease areas, negotiating fees for leases, project assessment and evaluation and mediating between the mariculture venture and local communities.

3. Institutional Aspects

Several institutions operating in the village environment are important in developing fisheries in Tonga, and they can play a particularly valuable role in mariculture development. The roles of the Tongan Fishermens' Association and the Town Officer are particularly crucial.

The Fishermens' Association was established in 1988 as a voluntary organization with assistance from the Fisheries Division. It has grown rapidly with a current membership of around 3,000 and includes practically every village in the Kingdom. The purpose of the Association is to provide a formal mechanism for raising and discussing issues of vital importance to fisheries development, particularly small scale village fisheries. It also acts as a forum for assisting the Fisheries Division in the planning of fisheries development and in implementing particular development programs.

The Association has three branches located respectively on Tongatapu, Vava'u and Ha'apai and its affairs are guided by a governing council. The Fisheries Division continues to play an active part in the Association and provides the Associations' secretary (the head of the Fisheries Division) and the treasurer.

As a forum for highlighting fisheries issues and problems and bringing them before the

government, the Association has the potential to play a major role in the development of fisheries in Tonga. From the viewpoint of government, the Association can also be particularly useful in taking some of the workload off the Fisheries Division in the task of promoting artisanal village-based fisheries.

The Town Officer is a government representative in a village and acts as the formal intermediary agent between the village and the central government. He is appointed by the village (normally by local elections) and his responsibilities cover a multitude of tasks directed at promoting the social-welfare-economic needs of the villagers.

As a village resident familiar with village affairs and development needs, the Town officer can play a leading role in promoting development projects at the village level. This role is particularly crucial at the early stages of project development, especially in promoting the merits of a project and in negotiating terms, conditions and the nature of local participation.

4. Giant clam circle project

Tonga's "giant clam circles" have created considerable interest around the South Pacific region. This initiative is of interest in that it is a novel experiment and one which highlights many of the problems associated with mariculture in the Pacific islands context. The first giant clam circle was planted in 1986 (in June during Environmental Week) on a reef area in Nuku'alofa (fronting the present Ministry-of Education building) under the auspices of the Ministry of Land, Survey and Natural Resources (also involving the Fisheries Division and an outside research foundation) and since then at least four other clam circles have been established in various locations. The underlying rationale for the project is threefold: first, to revitalize the dwindling stocks of clams and secondly, to increase public environmental awareness, and to foster education on marine food organisms (Chesher, 1988).

Giant clam circles are a circular arrangement of around 100 clams spread evenly over an area of approximately one eighth of an acre. The main clam species are *Tridacna derasa* and *Tridacna squamosa*. Site location has to satisfy certain conditions (depth, clear reef bottom etc.) and preferably be close to areas of settlement to facilitate policing. A circle site is marked by a buoy and may be linked to the shore by an underwater trail (for the public to visit). Government has provided some funds for purchasing stock. The concept of planting clams in protected reef areas is apparently not new to the Pacific. As pointed out by both

Chesher (1988) and Johannes (1982), the protection of clams in this fashion is known to have been practiced in several other Pacific locations. According to Johannes, for example, the people of Shortland Island in Solomon Islands collected clams and placed them in protected areas, and similar practices were found in the Tagula area of PNG and on the island of Savai'i in Western Samoa. However, it appears that the primary purpose of clam protection in these cases was to ensure emergency food stocks rather than stock revitalization as such.

Tonga's giant clam circle experiment is based on the belief that such formations will protect and augment natural stocks. This belief is supported by considerable biological evidence and as pointed out by Chesher (1988, p.3):

"In areas where giant clams are kept in protected embayments for everyday food supplies there is an abundance of clams of all sizes in the same bays and in nearby fringing reef environment."

The placement of clams in a circle is based on the following considerations (Chesher, 1988, p.3):

1. The orderly and systematic placement of the clams assures they will not be mistaken for a natural population but are clearly placed there by someone; such an awareness will help prevent poaching.
2. The spacing of the clams equidistant from each other is important to maximize spawning.
3. Each clam can be identified by its position and this will assist in growth studies as well as spawning and mortality studies.

Other advantages for the project are that it does not depend on foreign aid, costs are minimal and its importance is readily accepted by the local communities.

Apart from the giant clam circle on Nuku'alofa, other clam circles have been established in the Vava'u group - on Falevai Village on Kapu Island; on Neiafu and Pagaimotu Island - part of a marine reserve park not far from Fuaa Harbour on Tongatapu. (The project on the latter site which was opened this year, is only a half-circle as not enough clams were available at the time to complete the circle).

Four possible sites for clam circles have been identified the Vava'u group of islands (Hunga, Tuanga, Mala and Ofu) but future developments will partly depend on the availability of funds.

Regarding progress, the giant clam circle on Falevai Village, Vava'u, established in 1988, appears to be doing particularly well. This success is due at least in part, to a favourable location: the clam circle is located near the police station (under construction at the time), is close to the residence of the District Officer and it is well placed to facilitate research work on the surrounding reefs. Success is also due to the way in which the project was presented to the villagers. From the very beginning the Governor of Vava'u took the initiative - he selected the site for the project and called a meeting of all Town and District Officers to explain the purpose of the clam circles. This initiative succeeded in winning the support of the local people who agreed to act as guardians of the project and to refrain from taking the clams.

By contrast, the clam circle on Nei'afu appears to have failed and future prospects are uncertain. The main reason for the lack of success was said to be a failure to control poaching. This weakness, in turn, reflects a lack of adequate policing of the project and support from the local community.

It would be premature to predict the future of Tonga's giant clam circle experiment and on the specific factors making for success or failure; but the experiment so far seems to point to the critical importance of having local communities actively involved in the project. Falevai Village experiment seems to support this conclusion; essentially, local people must be encouraged to appreciate the value of the project to their community and to feel that they have a stake in such developments. Among other things, their support is essential to control poaching.

5. Reef Property Rights and Possible Approaches For Successful Mariculture

As already noted, Tonga's system of reef and lagoon tenure is based on Crown ownership, but that for purposes of fishing (including mariculture), free access to the marine zone is available to all Tongans. Fishing - both commercial and subsistence - is carried on with few restrictions (the main restriction applying to fishing on marine parks) in relation to territorial waters and types of fish that may be caught. Given this system of tenure - which in practice

amounts to exercising common property rights - mariculture development demands that exclusive rights be acquired over the reef and lagoon areas needed for mariculture. Such rights can be obtained under the framework of existing legislation governing the leasing of reef and other categories of waters for aquaculture purposes.

Reef property rights

Specific terms and conditions for the leasing of reef and lagoon (and land in general) suitable for mariculture are provided for by legislation. For aquaculture purposes, the Fisheries Act of 1987 empowers the minister responsible for Fisheries to regulate lease terms, covering such areas as project site, demarcation of boundaries, environmental safeguards, government access to project results and leasing fees. The Act also places on the government the responsibility for protecting mariculture operations located on the leased areas.

Crown ownership of Tonga's entire territorial waters has clear advantages from the viewpoint of the prospective investor. It means that the investor needs to deal with only a single authority rather than a multiplicity of claimants exercising fishing rights over particular reef areas. It also has the advantage in that a consistent and uniform set of criteria can be applied for regulating leases.

In addition to leased areas, a certain level of mariculture activity can be undertaken on marine and related reserve parks. This kind of activity is illustrated by the giant clam circle project. Here, the right to conduct mariculture activity is based on a different set of legislation (Parks and Reserves Act 1976), and such activity is restricted to those projects with an environmental significance. However, in some cases, a degree of subsistence fishing (including collection of molluscs etc) is permitted. Such reserves can be useful for carrying out pilot or experimental projects that may prove valuable for subsistence.

External participation

The development of Tonga's maricultural potential beyond a small subsistence base invariably calls for foreign participation, particularly in the form of foreign investment. Such participation seems particularly beneficial when it involves a significant degree of collaboration with local people, through joint venture arrangements.

Foreign investment can be especially valuable in developing large commercial projects geared to export production. The benefits that the foreign investor can bring to a mariculture

project are several-fold.

Foremost are capital, management and technical expertise which are all in scarce supply in Tonga. Equally important are the benefits that derive from having access to overseas market networks and research facilities as well as the capacity to pass on through training, maricultural skills and knowledge to the local people.

Foreign participation through technological and financial assistance from bilateral and multilateral sources also has a role to play. This form of assistance has the advantage over foreign investment in that technology and finance can be obtained without surrendering control; a possible disadvantage is that such assistance may not be as effective as foreign investment in terms of marketing and management. However, such assistance can be valuable in particular cases, for example, in providing support for local groups that may wish to be involved in mariculture predominately as a small-scale subsistence orientated activity. Groups that may benefit in this way were said to be cooperatives and youth groups.

Tonga has succeeded in establishing the basic structure and services to facilitate foreign investment in mariculture and other sectoral areas. Leasing arrangements are straight forward and the Fisheries Division can provide basic information on technical aspects including suitable areas for mariculture, leasing arrangements and potential local partners. Other forms of assistance, including tax concessions, are also available.

Location

For clam culture, as probably for other kinds of mariculture, Tonga offers many suitable locations by virtue of its extensive reef and lagoon areas and related natural advantages. This being so, the choice of an actual site will depend on other factors which are likely to influence the successful operation of a project, for example, proximity to coastal communities, transportation facilities and the extent to which local groups are receptive to the project. Official views on possible sites can also be important, especially where, as in Tonga, increased decentralization of economic activity is a major government development objective.

One question that has to be resolved is whether to establish clam projects close to coastal communities or to choose more distant locations. Closeness to coastal communities can be advantageous In cases where the cooperation of local people is sought, possibly in connection

with the effective policing of project operations. However, for larger projects with significant foreign investment a location away from populated areas may be more attractive. Among other things, such a location may allow the project to proceed with a minimum of outside intrusion.

The results of my inquiries regarding specific sites for a major giant clam venture suggest that the Ha'apai group of islands may be the most promising and merit serious consideration.

The Ha'apai group lies halfway between the Tongatapu group in the south and the Vava'u group in the north and comprises a somewhat scattered archipelago of 51 islands, only 17 of which are inhabited. (See Map 2). The group has extensive reefs and lagoons, some of which are rich in marine life (e.g. the islands of Nomuka, Mango, O'ua, Kotu, Lofanga and 'Uiha).

Ha'apai's population totalled 8,978 in 1986 (Government of Tonga, 1988, p.14), of which just over 70 per cent are located on the Hahake sub-region, north-east of Ha'apai. The group has suffered a loss of population in recent years both to Tongatapu and overseas and has one of the lowest per capita incomes in the country: T\$335 in 1981/82 versus \$634 for Tongatapu and \$440 for Vava'u. Its economy is based on fishing and copra making and has a strong subsistence base.

Ha'apai's potential for clam culture is based in its extensive reef and lagoon areas, some of which presently appear to be little used. Ha'apai is also favoured as a site for a major clam project for other reasons. One relates to that fact that Ha'apai is in a state of economic stagnation and could benefit considerably from the introduction of a new project. Another reason is based on what one observer described as "the mentality" of the Ha'apai people their industriousness, thriftiness and commercial mindedness - qualities that are likely to ensure success in a new mariculture venture.

Officially, there appears to be firm support for establishing a major clam project on Ha'apai - for one thing, such an initiative is consistent with current government policy favouring greater decentralization. It is apparent also, that such a project would interest aid donors whose assistance would be required to strengthen infrastructure and related requirements. Australia, in particular is committed under current aid arrangements with the Government of Tonga to channel a portion of aid funds for Ha'apai's development.

Local participation

Almost all field informants in Tonga stressed that the key to successful clam cultivation in Tonga and mariculture in general, is to work with the local people. Even though Tongans themselves have no legal claims to reef areas, their cooperation is, nonetheless, vital for success. The importance of securing the cooperation of local communities has been noted throughout this paper and is clearly illustrated by the giant clam circle project on Vava'u. Here, a major reason for success appears to stem from the fact that the project was, from the very beginning, set up with the close involvement of the community.

A vital pre-requisite for success is to work out the mode of cooperation between the venture and the local community. The local community should be made to feel that it has a vested interest in the venture. The nature of community participation can take different forms, including various kinds of joint venture arrangements allowing for a degree of local ownership: here some flexibility is required to allow, for example, the deferment of equity payments. Other meaningful forms of local participation include involving villagers in decision making and creating employment opportunities.

Meaningful participation will help sustain local interest in the project and, in practical terms, make for effective policing of operations to deter poaching and unwarranted intrusion from local fishermen.

6. Conclusion

The tenurial and legal framework in Tonga for clam culture and mariculture in general, is highly favourable. The tenure system applying to reefs and lagoons (as part of the Tonga's territorial waters) is based on Crown ownership which, however, confers on all Tongans virtually unrestricted rights to fish anywhere within these areas. Leasing of reef and lagoons for purposes of mariculture, along with associated terms and conditions, is provided for by legislation.

Beyond leasing arrangements, several other aspects need to be considered in any attempt to set up a successful clam project, including commercial ventures with significant foreign investment. These aspects include:

- working closely with local people - the cooperation of nearby coastal communities is

essential; active local participation should be encouraged including participation as joint venture partners.

- effective policing arrangements of mariculture operations can only be achieved with the assistance and cooperation of local groups
- collaboration with village-based agencies and support from the Fishermens' Association and the village town officer can be particularly valuable, especially at the formative stages of a project.

As for specific locations for launching a major commercial clam project, many informants pointed to the Ha'apai group of islands - with its extensive reefs and lagoons combined with the purposefulness of its people as perhaps having the best potential.

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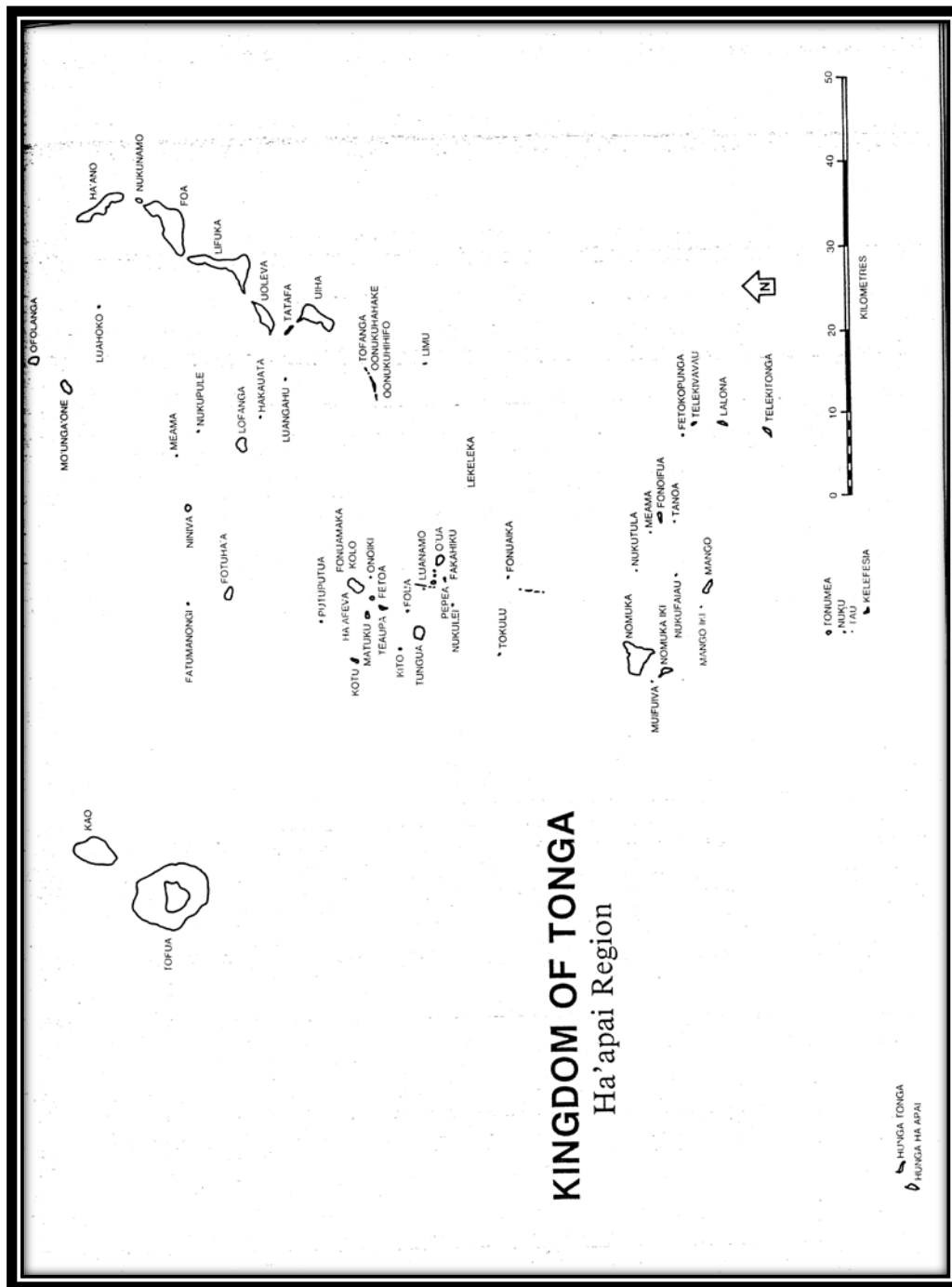
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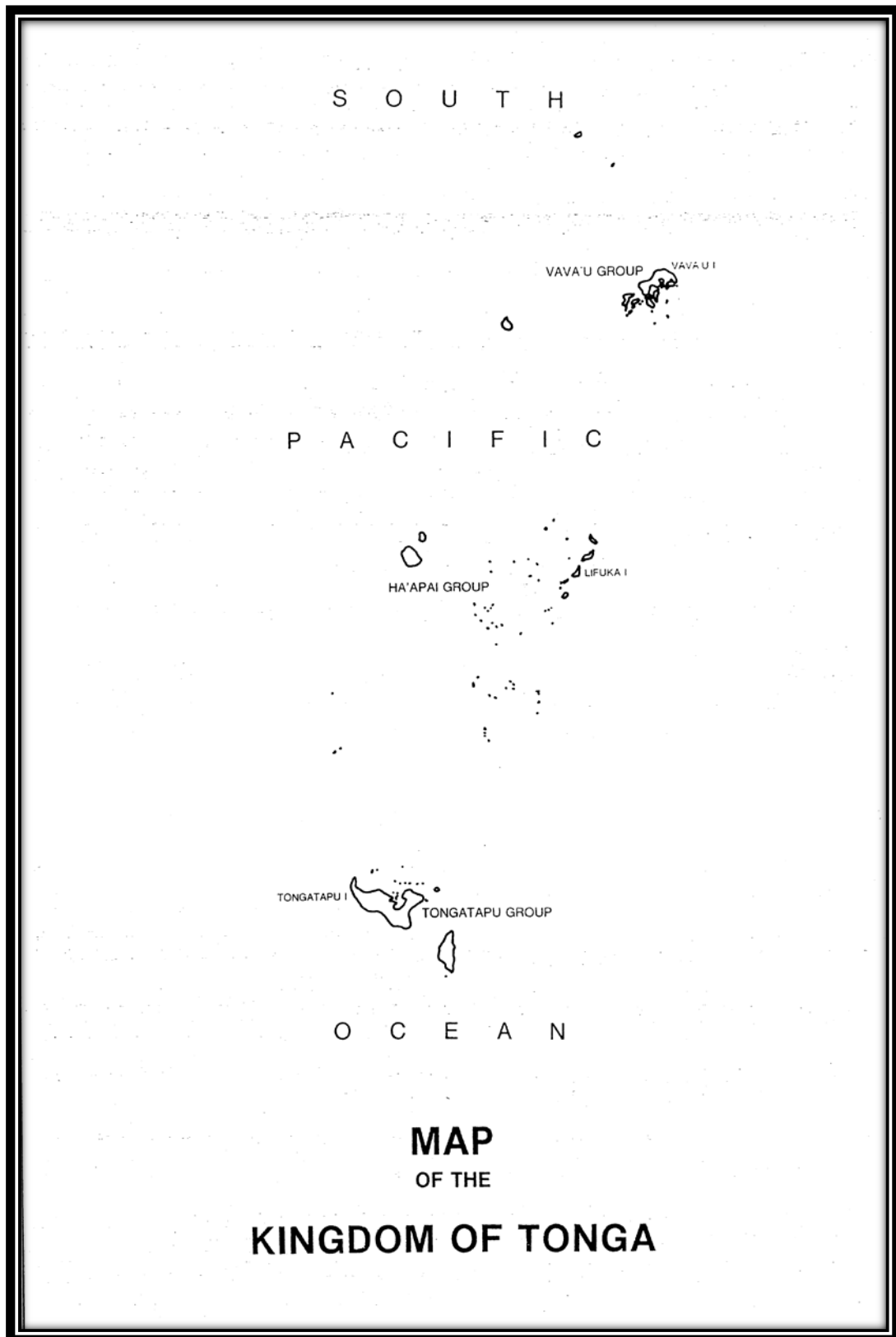
LIST OF PERSONS CONSULTED IN TONGA

Semisi Fakahan	Principal Fisheries Officer, Ministry of Aquaculture, Forestry or Fisheries.
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Robert W. Wall	Second Secretary (Development Assistant) AIDAB, Australia High Commission.
Peni Moala	Fisherman, Pelchalce Village.

Map 1



Map 2



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