

RESEARCH REPORTS IN THE ECONOMICS OF GIANT CLAM MARICULTURE

Working Paper No. 24

Subsistence Economic Activities and
Prospects for Clam Farming in Ono-i-Lau, Fiji:
Socio-economic Factors

by

Veikila Vuki, Clem Tisdell and Lucca Tacconi

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Farming in Ono-i-Lau, Fiji: Socio-Economic Factors¹**

by

Veikila Vuki², Clem Tisdell³ and Luca Tacconi

May 1991

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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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SUBSISTENCE ECONOMIC ACTIVITIES AND PROSPECTS FOR CLAM FARMING IN ONO-I-LAU, FIJI: SOCIO-ECONOMIC FACTORS

ABSTRACT

Local interest in and the potential contribution of giant clam culture to village economy in Ono-i-Lau, Fiji, is investigated. While villagers are interested in the possibility of giant clam farming their main interest arises from the possibility that this will add to their cash income. They are particularly on the lookout for such possibilities because the main source of their cash income now (apart from remittances) is copra. Copra prices are unstable and have fallen. As clam stocks in the wild are still sufficient for local consumption, villagers are not interested in farming clams for subsistence purposes. The isolation of the Ono-i-Lau archipelago may make the commercial farming of clams there uneconomic. Also, if the objective of the project is to increase village income, clam farming might be less effective than alternative fishing projects.

Keywords: Giant Clam farming, Ono-i-Lau, Fiji, copra,

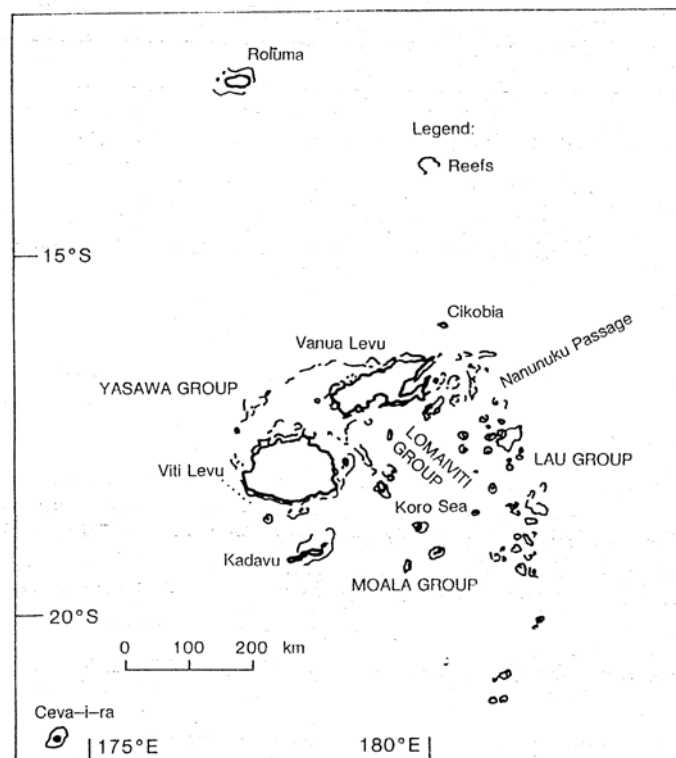
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SUBSISTENCE ECONOMIC ACTIVITIES AND PROSPECTS FOR CLAM FARMING IN ONO-I-LAU, FIJI: SOCIO-ECONOMIC FACTORS

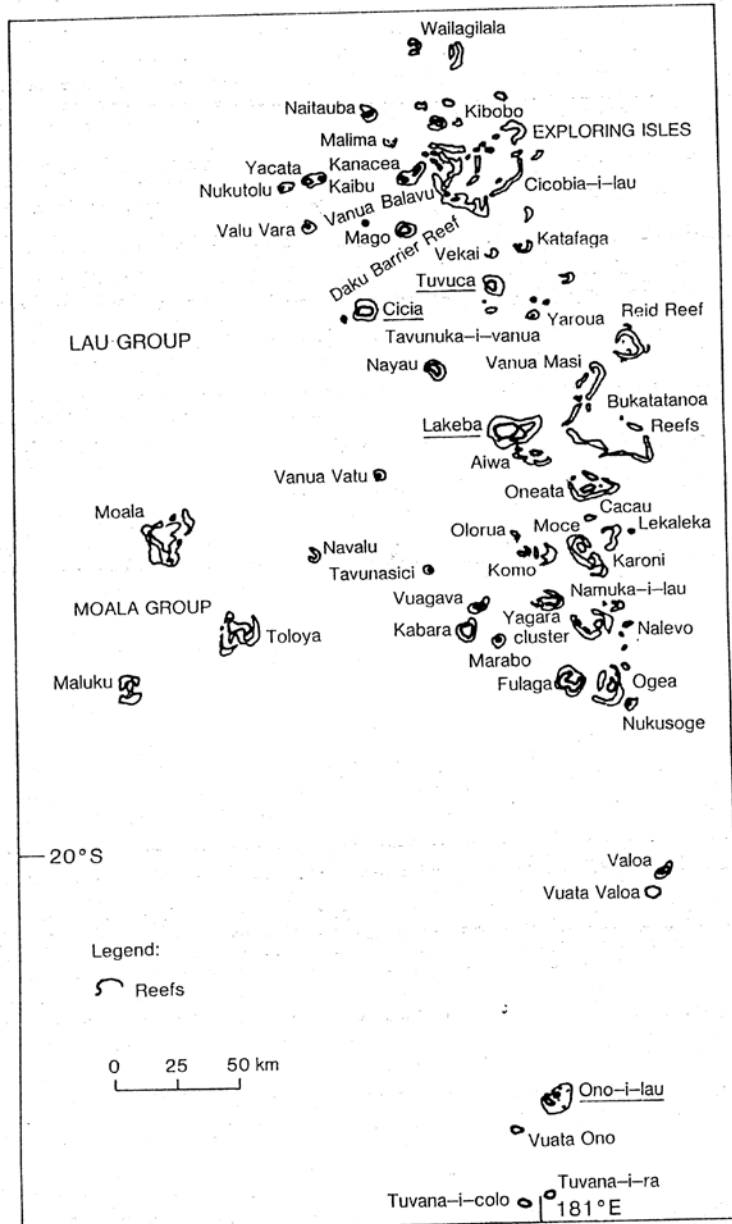
1. Introduction

This paper presents detailed results of a survey undertaken in the Ono-i-Lau Group, Fiji. The survey was carried out in order to ascertain the species of giant clams present in the islands, their abundance, and social and economic factors that could affect giant clam farming in the area.

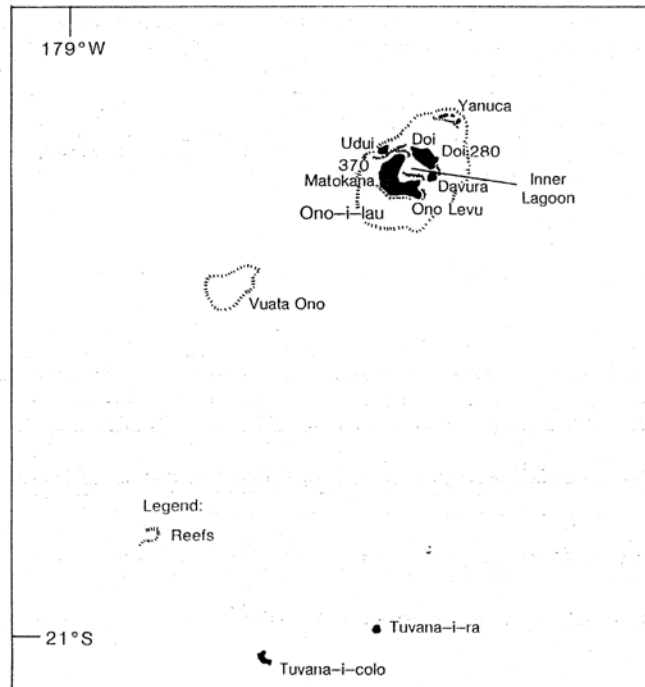
The survey undertaken in the Ono-i-Lau group was part of a survey covering the Lau Group, of which Ono-i-Lau is a part. (See maps 1-3)



Map 1: Fiji with Lau Group shown on right hand side of map.



Map 2: Lau Group, Fiji



Map 3: Ono-i-Lau, Lau Group, and outlying reefs and stacks

Field research was undertaken during the period June-October 1990 by Ms Veikila Vuki (who was born and raised in Ono-i-Lau) and interviews were conducted in the Lauan dialect. The isolation of the group restricted the number of the interviews that could be undertaken as travellers to the islands have to rely on a government inter-island vessel which takes a week to reach the islands and only stays for a few hours to unload and load cargo. Charter flights are available but very expensive and are only chartered by the Fiji Government during emergencies, such as 'up-lifting' a sick person from the islands.

It was decided to undertake a survey in the Ono-i- Lau Group for several reasons.

A survey carried out by the Fiji Fisheries Department, Giant Clam Project, on the reefs of Ono-i- Lau in 1985 and 1986 showed that there were still large populations of *Tridacna derasa* but that they were subject to, continuous artisanal exploitation. Small clams were found closer to villages and larger ones further away. However, abundant populations of *T. derasa* were found in Vuata-Ono, a non-emergent atoll about six miles to the southwest of Ono-i-Lau. The distant location of this site from the villages has probably helped to maintain the clam population. Commercial exploitation has had an important impact on clam stock in the area. Heavy harvesting was undertaken in the area in 1984 and 1985 by commercial

operators before the export of giant clams was banned by the Government.

Because of this impoverished stock of clams, giant clam farming could eventually boost local consumption and commercial exploitation. Villagers in the Ono-i-Lau group rely mainly on marine resources as a source of income, given the meagre local resources available. Increasing income through aquacultural projects seems to be a natural approach. However, isolation from main markets is an obstacle to commercial developments. These issues will be considered in the remainder of the paper.

2. Background to Ono-i-Lau

Ono-i-Lau consists of six main islands situated within a barrier reef. Ono-Levu, Doi and Davura are volcanic in origin and are part of the rim of a breached crater. Including all the islets and stacks, there are over one hundred islands covering a total land area of 7.9km² within a reef system of 80km² (see Map 3).

Ono-Levu, the principal island, is elbow-shaped with two hills joined by a neck of low land. Matokana village, in which eight out of the nine interviews were conducted, is situated on this island.

At the 1986 census, Matokana village had 20 households and a population of 132. The village has undergone substantial change. The population has decreased (present population 132 compared with 300 as reported in the Appendix). Marine resources (mainly pearl oyster shells) have replaced copra as the major source of income. Cash remittances from relatives who have migrated still represent an important contribution to household income.

The Ono-i-Lau Group is the most isolated of the islands in the Lau archipelago and it can take up to one month for cargo to reach Suva, the capital of Fiji, by sea. This poses serious problems in the exploitation of marine resources. If marine products are to be exploited on a commercial basis refrigerated vessels will have to be used for transportation, the cost of which will have a bearing on the market price of these products.

3. Results Of The Survey

In Matokana, eight interviews were conducted with four women and four men ranging in age between 40 and 90 years old. All respondents had many years (>10 between them) of fishing

experience. One interview was also conducted with the chief of Nakuni village.

The species reported in the area are *T. maxima*, *T. derasa*, *T. squamosa* and *T. 'tevoru'*. Clams are still common but less abundant than in the past with *T. derasa* probably being the species least available. Commercial exploitation, as mentioned above, appears to be the main factor in the reduction of numbers of this species.

Despite the exploitation of clam stock carried out for centuries by villagers for subsistence purposes, and for commercial reasons by commercial operators in recent years, the present stock of clams appears to be sufficient for subsistence consumption. All the villagers interviewed agreed that the present supply of clams was sufficient, although four respondents stated that they would like an increase in supply. The present consumption of clams varies between 2kg per week and 6-10kg per week per household when the weather is poor and people are unable to go fishing. Clam 'gardens' are still common in Ono-i-Lau and provide a good 'security stock' of food that can be used in periods of scarcity, e.g. after a cyclone.

All the interviewees liked clam meat. But it appears that finned fish is preferred to shellfish (See Appendix, Cf. Pollock, 1989). This suggests that an increase in clam meat supply (through clam farming) might lead to only a marginal increase in the consumption of clam meat. This could have a limiting effect on the scope for subsistence farming. However, it is clear that we cannot be definite about this because insufficient research has been done to identify food preference functions for islanders with any degree of precision, e.g. to establish indifference curves.

All interviewees indicated that women were better suited to intertidal clam farming. Traditionally it is the women who spend time gleaning the reef flats for shellfish. Intertidal clam farming appears to be the most appropriate for various reasons. Villagers thought that subtidal farming could be a problem as it involves lots of time and only one group (young men) could take part in it. It should be noted, however, that from present knowledge of clam culture it is not possible to predict the amount of time (labour) that will be involved for intertidal or subtidal farming. A further problem in subtidal culture of giant clams is the eventual need for deep-sea (scuba) diving equipment. This would add to project capital investment costs, with the added shortcoming of having to rely on distant sources of supply for spare parts. Thus the farming of an intertidal species such as *T. gigas*, *T. crocea*, *T. maxima* or *T. hippopus* is likely to be more suitable than the farming of the subtidal species *T.*

derasa.

All villagers interviewed expressed interest in farming clams. This interest appears to be due to the need for an alternative source of income. Marine resources have replaced copra as the major source of income. This, however, is not due to a major surge in income from marine products but to a decline in copra prices. Villagers in Ono-i-Lau therefore see clam farming as a possible source of income. Only one interviewee expressed interest in subsistence farming of giant clams. Two women stated explicitly that there were enough clams in the wild for subsistence purposes.

When asked if there were any factors that might have a bearing on the success or otherwise of clam farming, one villager expressed concern about the difficulties in marketing clams which would arise from the remoteness of the island and the irregular transport to the capital Suva. Another interviewee specified that clam farming "would not create conflict of interest as there is quite a lot of fisheries resources to be exploited".

4. Comparison Of Ono-I-Lau Survey Results With Those Of Lakeba Island

Clam meat supply appears to be dependent on local availability (village level) and probably on the amount of time that villagers dedicate to collecting clams. In Lakeba Island, villagers of Tubou and Levuka described clams as less abundant than in the past and indicated that clam meat supply was not sufficient. In Waitabu village giant clams are no less abundant than in the past and meat supply is sufficient.

This variation in the supply of clam meat at the village level on the same island could indicate that trade in giant clams is not frequent. This could be a reason for the villagers of Lakeba Island considering giant clams as a subsistence food and not as a cash-crop. In Waitabu and Levuka respondents indicated that they were interested in clam farming for subsistence purposes. Tubou villagers were not interested in giant clam culture. Amongst the three villages, Tubou appears to be the least dependent on marine resources.

The interest in clam culture expressed in Waitabu is in striking contrast with the results from Ono-i-Lau. In both cases clam supply for local consumption seems to be satisfactory, but Waitabu villagers are interested in clam culture for subsistence reasons, whereas Ono-i-Lau villagers explicitly indicated that they see clam farming as a source of income. This raises

some doubts about the genuine interest in clam farming in Waitabu village. People sometimes like to have development projects as a possible means of raising the status of the village, or they might think that they can gain, even if indirectly, from the existence of a project (Tisdell, 1991).

One further interesting comparison can be made between results from Tubou and those from Ono-i-Lau. People in Tubou are much less reliant on marine resources than in Ono-i-Lau. In Tubou six respondents out of ten expressed no interest in clam farming whereas all respondents in Ono-i-Lau were interested in clam culture as a source of cash income.

This leads to some doubt about clam farming as an appropriate subsistence activity (Baker, 1988) in the Ono-i-Lau Group at least given the present level of clam stocks there and alternative means of earning a livelihood.

The factors that will influence the adoption of clam culture as a subsistence activity are input requirements, taste preferences and clam stocks in the wild. Implications of these variables for subsistence activity will be considered in the next section, together with some issues regarding commercial clam farming.

5. Socio-Economic Discussion Of Clam Culture

It has often been assumed that labour requirements for clam culture are minimal. This might be the case when clams are old enough to be left in the ocean without protection (e.g. without enclosures). However, the early stage of the ocean grow-out phase (e.g. when clams need to be kept in cages to be protected from predators) can be quite labour intensive, but will vary with the method of protection used and the age of clams grown out (John Hambrey, pers. com. with L. Tacconi). Thus, if wild clam stocks are sufficient for local consumption, it is reasonable for the villagers to collect giant clams from the wild instead of farming them.

Subsistence farming could be expected to be undertaken if clam stocks were dwindling. However, variables other than just clam stocks have to be considered. Input requirements for clam farming will have to be compared with input requirements for other subsistence activities, such as fishing or gardening. The higher the input requirements for clam farming compared to fishing the less likely it is that villagers will undertake such farming. Taste preferences will also affect clam farming. If clam meat is highly appreciated by villagers,

then they could be interested in clam culture even if it requires greater input than fishing. However, finned fish seem to be preferred to shellfish, at least in Ono-i-Lau. Clam farming also has the added disadvantage of requiring some capital investment at the beginning of the project with benefits only accruing after some years. In the case of subsistence fishing, capital investment is still required (e.g. boat, motor) but benefits are immediate and there is less risk of 'crop' or supply failure, given what appears still to be an abundance of fish in the Ono-i-Lau archipelago.

The villagers in Ono-i-Lau are interested in having an alternative source of cash income to that earned from copra. This could open the way to a giant clam project for commercial purposes. Some issues that might affect the success of such a project should be considered.

When the aim is to increase village income, returns from a clam project should be compared to that of alternative projects, such as a fishing project whose purpose is commercial exploitation of local fish resources.

The disadvantage of a clam project is the risk involved. Both projects would require an initial capital investment (to be assessed) but benefits gained from a clam project would only start after some years. This presents a risk for the villagers. In the Solomon Islands, experience with clam farming at the village-level shows that clam losses due to predation and natural causes can reach high levels (up to 80%) during the first two years of grow-out (John Hambrey, pers. com. with L. Tacconi). A fishing project does not involve such a risk.

Both projects would face the same problem of transport. Ono-i-Lau is isolated and transport is irregular. Given the long distances that separate the archipelago from Suva, cold-storage facilities may be required. The market price for fish and clams will affect the profitability of such projects. At the present stage data on transport costs and expected market prices are not available and further research is needed to assess the viability of establishing development projects in an isolated archipelago such as Ono-i-Lau.

To ensure the viability of commercial clam farming, a regular supply to the market should be assured. This would probably require the establishment of large clam farms that could provide a substantial clam meat supply. Village farms could supplement clam meat output from larger farms. However, when village farms are located in isolated islands such as Ono-i-Lau, a substantial meat supply is likely to be needed if transport and storage costs are to be covered.

That might require the villagers to specialise in clam farming and this specialisation could conflict with their current livelihood strategies and social life.

In developing commercial farming, the fact that wild clam stocks could become threatened by commercial exploitation should be taken into account. At least the possibility of some conflict should be recognised (Cf. Tisdell, forthcoming) and should be allowed for.

6. Conclusion

Villagers of Ono-i-Lau are interested in increasing their cash income which has been adversely affected by a decrease in copra prices. This need is reflected in their interest in clam farming as a possible alternative source of cash income.

Whether clam culture projects are economically viable in Ono-i-Lau depends on several factors. Limited access to markets appears to be a severe constraint to such development as transport costs could prove to be very high. Isolation also limits the availability of extension assistance required to start and carry out a project. The cost of such assistance would obviously be increased by isolation.

Labour input for clam culture is not yet known but there is evidence to show that it can be high in the early stages of the project. Labour needs should be compared with labour availability. It is often assumed that some slack labour is available in subsistence economies but as can be seen from the Appendix, the people of Ono-i-Lau already devote a considerable portion of their time to productive activities such as gardening. A detailed time-allocation study is needed to supplement this evidence.

In order to maximise benefits to the local community from a development project, returns from a clam project should be compared with an alternative project, such as a commercial fishing project before a decision is made. One needs also to study the village economies not just in relation to their locality but in relation to their wider connections through migration to urban and other areas and remittances received from migrants (Bertram, 1991; Sofer, 1991). This is a wider subject but village development in the Pacific Islands needs to be seen in its wider interdependent economic context. There has been net migration out of Ono-i-Lau. One alternative to additional local employment and development can be migration, for example to urban areas even though the desirability of such migration remains a contentious issue in the

academic literature (Cf. Safer, 1991).

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APPENDIX

THE SUBSISTENCE FISHERIES OF ONO-I-LAU AND THE RESPECTIVE ROLES OF MEN AND WOMEN**

by

Veikila Vuki (nee Vakamole)

*

* This is an edited version of an assignment completed by Veikila Vuki when she was an undergraduate at the University of the South Pacific. Veikila is originally from Matokana, Ono-i-Lau. (Clem Tisdell)

THE SUBSISTENCE FISHERIES OF AND THE RESPECTIVE ROLES OF MEN AND WOMEN

Matokana has a population of about three hundred people excluding those who have settled in Suva or other parts of Fiji. The area covered by the village is about 300m by 250m.

The regular source of cash income is from copra. Both men and women are involved in cutting copra and it is usually done once a week by each household. Money obtained from cutting copra is used to purchase sugar, tea, etc. from the village co-operative store.

Other sources of income are cash transfers from relatives with salaried positions in towns. But this applies only to a minority who have close relatives in the towns.

However, some young village boys who have left school and some middle-aged men engage in seasonal casual work. Such seasonal casual work includes harvesting sugarcane in Vanua Levu and on the Western side of Viti Levu, and planting cocoa as part of the Tavenni cocoa project.

These jobs are only available on a seasonal basis. Only half the wages obtained by those who undertake such work is retained by them. The other portion is used for village development, such as building more water tanks, contributed to funds for extending the church, for the village hall, etc.

Villagers working in Suva usually donate money to be used in village project development, e.g. towards buying items such as an electricity generator for the whole village.

Sales of mats, coconut oil, tapa, and other items bring a little extra income into the village, but it is a meagre addition. Most of these items are 'lost' on their way to Suva where they are usually sold by relatives.

SUBSISTENCE FISHERY

Fishing has always been vital to our people and in the past they relied upon the sea for most of their protein. Today they continue to rely heavily on fish.

Fish remains the protein staple. Chicken, pork, canned beef etc. may be eaten only on special occasions for example during a wedding feast. Therefore subsistence fishing is essential to our -coastal community, especially on a small island like Ono-i-Lau.

The subsistence fishery is concentrated on lagoons, mangroves, coral reefs and mud flats. Very little offshore fishing has ever been conducted by the villagers. This was only done by villagers at Vuata Ono on their way to Tuvana islands in the past.

However, finned fish and shellfish are both important in the diet of the villagers. Finned fish is much preferred. Shellfish is usually only exploited when rough seas or bad weather prevents fishing or when the members of the household want a change in their diet from finned fish.

Finned fish preferences vary because individual tastes vary. But usually lagoon snapper is liked by nearly everybody in the village.

FISHING CRAFT

In the past, people of Matokana built canoes (dugouts) from two coconut trunks tied together by using sinnet. Building of such "waqa ma" demands a lot of craft knowledge and skill.

Coconut dugout canoes do not last long so villagers prefer outrigger canoes which are usually constructed on Ogea, Fulaga, Kabara and Namuka, the islands traditionally famous for canoe building.

These smaller outrigger canoes were used mainly in subsistence fishery by the subsistence fishermen but now they have been replaced by introduced craft. At present, there are two outboard motor-powered craft owned by the people of Matokana and about three are owned by individuals in the village.

However "it is disturbing to witness the passing of an art and tradition of navigation, seamanship and craftsmanship and with it increasing dependence by the once independent island people on the technology of the Western World" (Zann, Page 2).

Subsistence fishermen in the village were formerly self-sufficient, but today they rely on outside suppliers for fishing gear, motors, punts, fuel and repairs. In many ways their craft (motorboats) require careful maintenance and demand a basic knowledge of mechanics in

order for simple repairs to be done on the island. If spare parts are needed these have to be ordered from Suva.

ROLES OF MEN AND WOMEN

The people of Matokana are hard-working people. Men and women support one another in cleaning the village in order to live in a clean environment.

A man is always being praised for the size of his garden whether it is a vegetable garden, grows yams or cassava. Women do not in any way get involved in gardening, but they usually visit the gardens to fetch vegetables.

Men usually visit their garden very early in the morning for example at 5.30 am. Each man in the village is expected to have a garden and usually spends the whole day in the garden, except on occasions when they have to help build a house in the village or if there is a ceremony going on in the village. Men also help in preparing food. For example they make "lovo" nearly every afternoon after spending the whole day in the garden.

A man has to be both skilled on land and in the sea in order to be liked by the elders, and to be called a "hard-working guy". A man who is well known for being an expert in spearing fish and goes out fishing nearly every day and does not own a garden is termed a "lazy guy" because one has to learn good management in order to manage a household well.

Women work as hard as men. They have to see that food is always available for the household and they also decide on what the household has to eat, today and tomorrow. Therefore family budgeting is done by women. They only have to consult with the men on what to bring from the garden.

The women's club in existence in the village is typical of village women's clubs everywhere in Fiji. Its activities include sewing sessions and the occasional fund raising effort for the church or school. It is usually effective in getting action when an occasion requiring women's co-operative effort arises.

Men only occasionally go fishing at nights when they want to or when there is a special occasion. Usually men go fishing on Saturdays so that the fish caught can be eaten on Sunday, a day that we respect and strictly honour. It is a day of rest and religious worship.

Women engage in a lot of fishing for reef-fish, shell-fish, crabs and crustaceans. For example, a group of women sometimes go and spend two or three nights in Udui fishing and processing their catch before they return to the village. Therefore, if account is taken of all the fishery products included in the household diet, women contribute more in quantity than the men. However, men contribute a lot in terms of fish catch/unit effort even though women go out more often to fish.

FISHING TECHNIQUES AND GEAR

The fishing techniques and gear used in Matokana are mostly of a primitive character. Many exhibit traditional skills in their design and operation and indicate that local people have considerable knowledge of the habits of the particular fish or crustacea sought. Techniques include

(i) Use of bare hands:

This fishing method is common among women. They use their bare hands to catch crabs in mangrove areas, take crawfish and to collect all kinds of shellfish.

In the old days, women wrapped tapa around their right hands to protect themselves from injuries while collecting crawfish. They know that the favourite haunts of crawfish are holes in the rugged seaward face of the reef, below the level of breaking rollers.

"Qoli muji", which literally means reef fishing when the tide is low, is very common among middle-aged and older women. Fishing gear includes a piece of sharpened wood for piercing octopi, an iron rod to break coral reef and use of bare hands. Trigger fish; butterfly fish, groupers and other reef fish are usually caught.

However, sometimes hand nets are used on the reef but it is not as common as "Qoli muji".

(ii) Poisoning:

This fishing method is being abandoned due to the fact that the government has declared it to be illegal. In the past, it was usually done at night by men and sometimes during the day by either men or women.

When it is done at night men are involved and during the day it is usually women and children. Nursery grounds are first located and then the "derris" is used to stupefy the fish.

This fishing method is usually done by two households combining.

(iii) Spearing:

Of all the fishing methods practised in Matokana, spearing is most popular among men. Young village boys practise with miniature spears near the shore. The shafts of miniature spears are made from reeds and the spearheads are made from umbrella ribs. This is done so that when they become men they will be experts in spearing fish from the shore, or from boats.

Spearing is done not only during the day but also at night when men are free from working in the gardens. Torches of dried coconut leaves are often used. Sudden exposure of fish to bright light helps the fishermen to spear them.

Traditional spears are usually made of wood to which wooden spearheads are tied with sinnet. But nowadays steel barbed spearheads are being sold in the village store.

(iv) Fish Traps ("Kawa"):

This was one of the most common fishing methods in the past, but now only about three households use it. The traps are woven by old men but it is the women who use them.

Baits used are usually crushed crabs and sea stars. Women use outrigger canoes to set these traps by rowing to suitable places. Fisherwomen know suitable places as a result of their experiences or by being told by their elders. Coconut husks are used as marker floats and white stones as sinkers.

Fish caught are usually large snappers and other big fish attracted into the trap by the smell of crushed bait. When it is time to lift the trap, women know that there is plenty of fish if the trap feels light. This is because fish thrust the trap upwards as it is pulled up.

(v) Nets:

Hand nets are usually used by women. These consist of a rectangular length of netting tied or laced at each end with a pole placed transversely to the length of the net.

In communal fishing, large surround nets are used to catch goat fish near the shore. This is done only by women.

(vi) Hooks and lines:

Females do not go fishing using hooks and lines. This is only done by men usually on Saturday or weekday nights. Bait used includes land hermit crabs, fragments of octopus and small fish such as goat fish. But octopus fragments are most favoured.

Light lines, sinkers and small hooks are used effectively in lagoons and shallow areas. Two hours of fishing in the lagoon usually provides enough food for a household. Small snappers are an especially esteemed lagoon fish caught by this method.

(vii) Fish Drive (“Yavirau”)

Fish drives are only undertaken before Christmas, New Year or Easter in order to provide the villagers with fish for feasting. They are only used on important occasions because they demand so much organisation and preparation.

Each household has to contribute to their share of the scare-line as ordered by the "Tuinidau". A scare-line is made up of "wa" knotted together and is wrapped spirally with the longitudinally split halves of coconut leaves. A very long scare-line is used to enclose an area of water near the reef flat with a view to driving all the fish into the 'bag'.

Everybody takes part in the fish drive. Sharks are allowed to escape as they would devour some of the fish and break the bag. Big fish are speared whenever possible, once again so as not to damage the scare-line.

By tradition, the fish catch is normally shared among all the households in the village. However in some cases only those contributing to the scare-line obtain a share.

Everybody enjoys being involved in a fish drive. It provides a rare social occasion for all the people of the village who come together to fish.

POTENTIAL COMMERCIAL FISHERY

Ono-i-Lau's only available resource for commercial exploitation (apart from copra) is its aquatic resource. It is surrounded by fringing reefs with extensive reef slopes. Its fishery potential is considerable.

But commercial fishing does not exist. Residents use fishing as a source of food for direct

household consumption. Although the exploitation of fishery resources could offer village people good commercial prospects, there remains the problem of marketing and transport because Ono-i-Lau is distant and isolated from the main markets. Transportation costs to market alone are likely to be very high and the chances of fish reaching the market in good condition may be low.

Above all, the boat entrance to the lagoon is intricate and extremely difficult unless tide and wind are favourable and it can only be used by small boats. However, a small air-strip could be considered. Planes usually visit Ono-i-Lau once a fortnight. But air transport is also costly.

The above factors concerning barriers to commercial fisheries should be taken into account before a potential fishery product is chosen for commercial supply.

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