Technical Report

PRELIMINARY BASELINE SURVEY OF MARINE RESOURCES OF KABA POINT, FIJI

by

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LIST OF CONTENTS

List of Figures

List of Tables

BACKGROUND

This survey was agreed to as a result of a field trip in November 1994, by the participants attending the Coastal Fisheries Management and Development course. The field study in Dromuna village in Kaba Point, Viti Levu, Fiji was part of the course which was sponsored by University of the South Pacific (USP) and the International Ocean Institute - South Pacific Operational Centre. During the preliminary discussions at the village hall, issues were raised regarding the problems of the locally managed fisheries cooperative. The residents of Dromuna village, worried about the future of their fisheries projects, requested a baseline survey from the Fiji Fisheries Division and the University of the South Pacific's Ocean Resources Management Programme. The villagers were convinced that any future decision on the use of their fisheries resources should be undertaken based on quality data.

The request for a study was seen as a unique opportunity for the USP staff to collaborate with the Fisheries Division on a project that has been asked for by people at the village level. This survey was to be the first of its kind and everyone involved was hopeful that the work done at Kaba Point would set a precedent for cooperation between villages, the Fisheries Division, and the University. Future surveys are anticipated to refine the data presented here and provide information which could be compared to the data presented in this report.

The aim of this initial visit was to collect data with which to evaluate the state of marine resources in the Kaba Point area and make suggestions for appropriate and suitable actions for the communities. The objectives of this study were twofold: to set up a good database on the status of the area's resources and to help develop a suitable management strategy that would allow for sustainable marine resource-based projects, the improvement of the village fisheries co-operative and the address of problems associated with the perceived decline in marine resources.

The people of Dromuna were concerned with the current state of their marine resources and wished to establish a baseline database. The people wanted a biological survey to provide insights into the marine resources within their fishing realm. In addition the villagers wanted an overall review of the socio-economic situations in the two villages. The villagers were specifically interested in the problems facing their fishing cooperative and the options available to them in the future. The feeling amongst the villagers was that they could no longer afford the tradition of exilating one resource then another as the previous one becomes depleted or saturated. The people of Dromuna were adamant that all future actions be based on concrete scientific and socio-economic study data.

This is the report of the preliminary survey that the multi-disciplinary research team undertook in February, 1995. The socio-economic interviews and observations were made on both Dromuna and Vatani villages while the preliminary biological baseline surveys were conducted in the fishing ground. The socio-economic survey team consisted of the government team made up by the Assistant Roko and the Assistant District Officer and Ms Vina Ram Bidesi and Mr Joeli Veitayaki of the Ocean Resources Management Programme. The biological survey was conducted by Mr Apolosi Turaganivalu and Mr Benedito Tikomainuisiladi of the Fiji Fisheries Division and Ms Elizabeth Matthews and

Ms Anne Ballou who were visiting scholars attached to the Ocean Resources Management Programme. Fortunately for the study team, their visit to Kaba coincided with tha annual visit to the Muaikaba Cooperative by an officer of the Cooperatives Department who provided inside information on the operation of the cooperative in the village. The report, though based only on a week's stay in the village, provide useful information on the changing situation in fishing villages. The relationship between traditional and modern resource use systems and the changing abundance of marine resources relating to the use of more efficient fishing equipment and technique was an interesting study topic. The important role of women was observed while the inherent issues affecting the sustainable development of marine resources was a major point of interest.

INTRODUCTION

Kaba Point is situated on eastern Viti Levu, approximately 30 km from Suva and 15 km from Nausori. The area is isolated with no roads connecting it to the rest of Viti Levu. There is extensive mangrove and river systems in the area. Kaba Point is accessible only by boat via the Namata River or along the coast (FIGURE 1).

The high chief of Bau and head of the Kubuna confederacy, the Tui Kaba, Na Vunivalu owns the fishing rights in Kaba Point and in the whole of Kubuna waters. The people are free to fish for subsistence but are encouraged to have a licence if they are operating commercially. The special ties with the Tui Kaba, Na Vunivalu is shown by the fact that there is no traditional protocol of *tama* (a shout of respect to a chief) to the Tui Kaba, Na Vunivalu and his family in Kaba. The people of Kaba offer their yearly gifts of fruits (*sevu*) to their high chief the Tui Kaba, Na Vunivalu.

An important traditional activity in Kaba is the fishing of sting ray (*sua vai*). To summon the people to fish, the chief will present a whole *yaqona* plant which will then be shared amongst all of the land owning units (*mataqali*) of Kaba. On the fishing day timing is crucial. The operation must not be late. During the operation which is equated to war, the men compete for *voto ni vai* (skate-thorn) which is forcibly plucked from the fish to signify a catch. During the *sua vai*, the women and children observe silence in the village. To seek forgiveness, the people of Kaba make offerings of skate-thorn (**voto ni vai**) and not the whalestooth as is the practice in other areas of Fiji.

The people from Vatani and Dromuna are from the same *Yavusa* Naitodua. The people have small gardens for their subsistence requirements. Root crops and other garden produce are not sold. Fish and coconuts are the main sources of income for the people.

The coastline in front of the villages on Kaba Point are protected by seawalls. The villagers are now asking for more concrete so that they can extend the protected area.

Nutrition in the village was of high quality. The domination of seafood in the diet was notable. In the three days we were in the village, fish featured in all of the meals including breakfast. The transition to consumer products was also evident with the pudding, pancake, biscuit and butter that were on the table during meals.

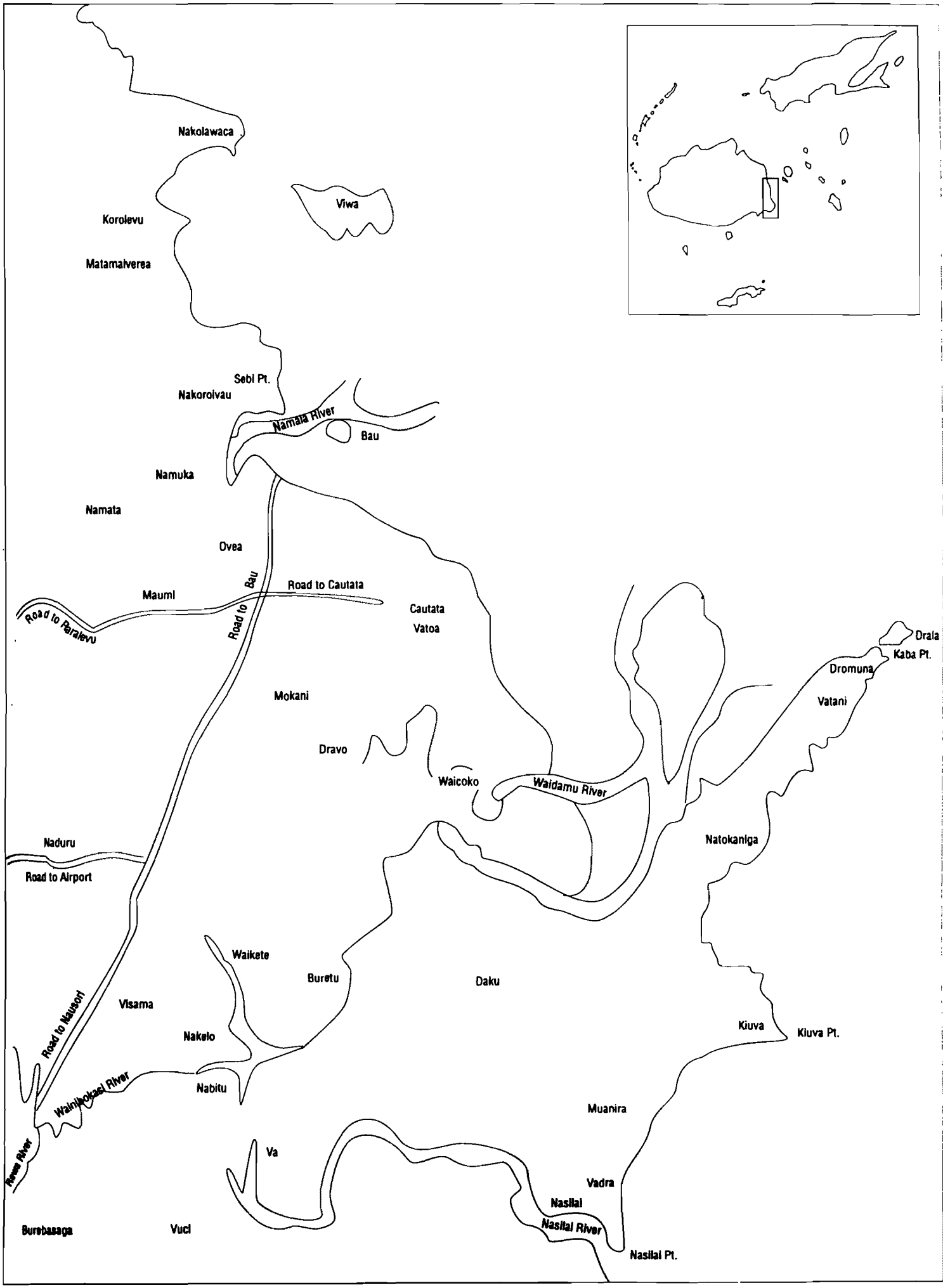

FIGURE 1. Kaba Point and the surrounding areas.

Dromuna and Vatani villages, have fishing access rights to the Kubuna Customary Fishing Area. In terms of total area, this traditional fishing ground is more than 300 km^2, stretching from Kaba Point north nearly all the way to Moturiki Island off Ovalau.[1] Information obtained from village interviews and from speaking with the cooperative's officers indicates that villagers use the immediate area and fish quite extensively in the roughly 25 km^2 inshore area adjacent to the point.

The area fished by the local fishers is primarily shallow mud and sand flats, mangrove areas, and some deeper channels (to 20 m) (FIGURE 2). The use of gillnets is the most common method used to exploit the fisheries resources. There were indications that other fishers from nearby villages may also make use of resources within the Kubuna fishing rights area although they technically have access rights to different but adjacent fishing areas. In addition, 17 permits were issued in 1994-1995 for fishermen to commercially fish in this area. Commercial fishing operations are generally small-scale artisanal operations consisting of an individual fisherman or a group of three or four men working together. The fishermen who come from the Nausori area are predominantly of Indian descent. Some of the fishers use handlines, spearguns, and traps. The most commonly caught fish are: snappers, mullet, and sting rays.

Women glean the exposed inshore areas at low tide and are collecting in an area that extends from the shore all the way to Toberua Island. They generally walk along the reef flats, collecting as they go. Some women travel in groups by punt to more distant reef areas. The women visit these areas several times a week, depending on the weather and activities in the village. Some organisms they collect include sea cucumbers, shellfish, small crabs, seaweeds, and sea urchins. Groups of people also dive in deeper channels off the village shores for spider shells.

Groups of women from Vatani harvest *nama* (*Caulerpa* spp., sea grapes) from the main reef as well, travelling out in motor powered punts at low tide. *Nama* has been described as the "most preferred" seaweed served on Fiji's tables (South 1993). The plants themselves are erect, growing to approximately 7 cm. They are collected from back reef areas all year round and can be harvested regularly if proper care is taken with the plants while recovering them. If the roots and stolons are kept intact, the plants will regenerate new shoots that are harvestable within three to four weeks. Three species occur commonly in Fiji: *Caulerpa racemose, C. chemnitzia*, and *C. occidentalise* (South, 1993). Other seaweeds that are harvested include *Hypnea pannosa* and *Gracilaria verrucosa* (FIGURE 3).

The shallow water between Kaba Point and Drala Island, off the point, is the chiefly bathing area for the Tui Kaba, Na Vunivalu and all forms of fishing and collecting are prohibited within its borders. Fishing is conducted in this area only when a request from the chief is received. Fishing in this spot is infrequent.

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[1] The information regarding the Kubuna waters was kindly provided by the Native Lands and Fisheries Commission. Details of this fishing rights area have not yet been officially approved.

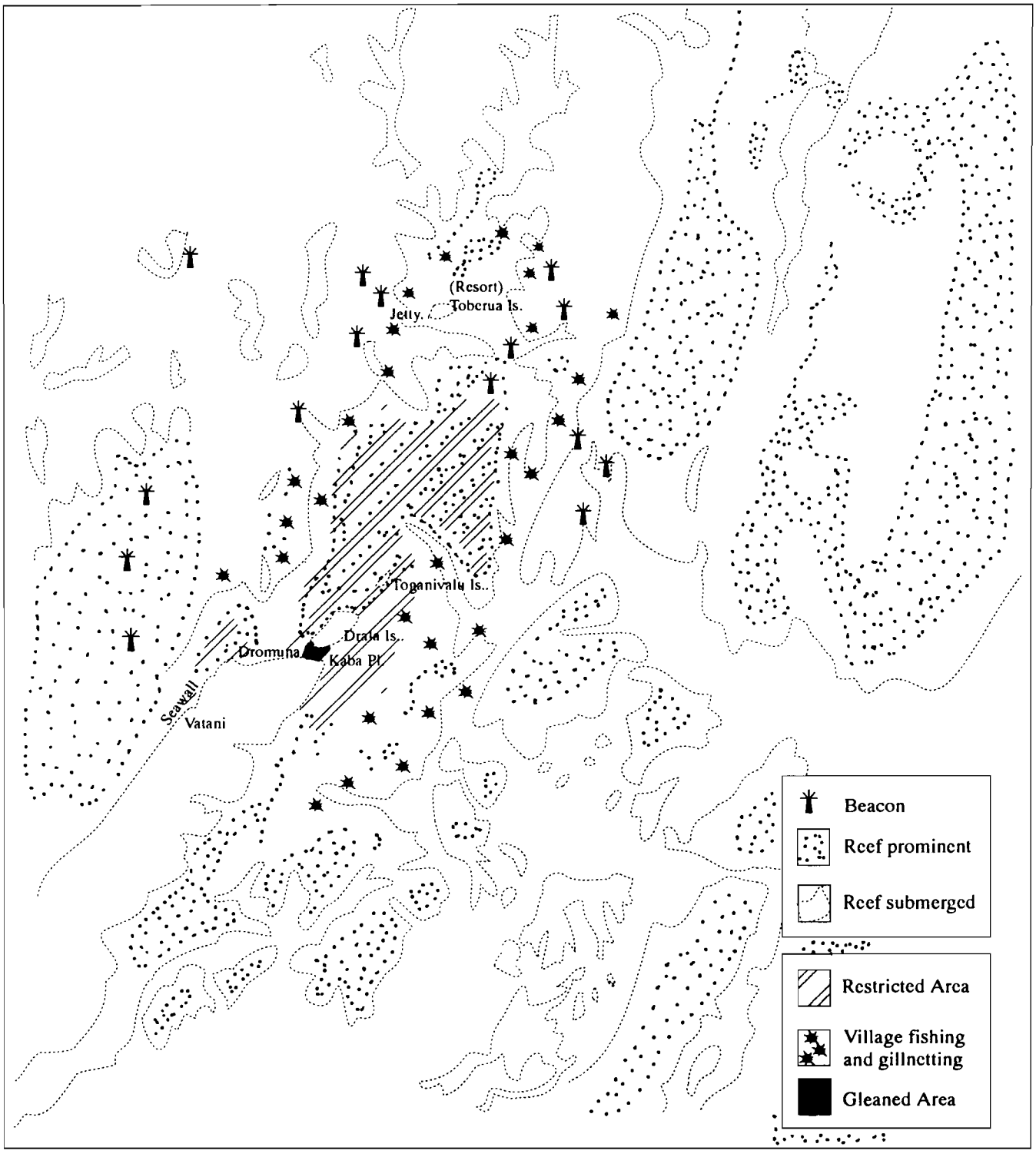


FIGURE 2. Primary fishing grounds of Kaba Point residents.

Some Vatani villagers have also been collecting corals for export since the 1970s. In the past 3-4 years harvesting activities have increased to meet the demand in the foreign market for live corals. The collectors usually visit the reef two times a week, and transport the corals to the Mataidreketi landing. The corals are packaged either in Vatani or at the landing and are flown from the Nausori Airport to destinations such as the United States. These activities for the most part are unregulated and information on which coral species are collected and the volume which is exported is scarce. A few people from Vatani are collecting corals to sell. Coral is also collected for medical use (bone grafts, dental work and eyeball material). Permits have been granted to Acropora Fiji, Limited and Sea King (Ryan, 1994). There is, unfortunately, no quantitative data on the amount of coral collected in the area.

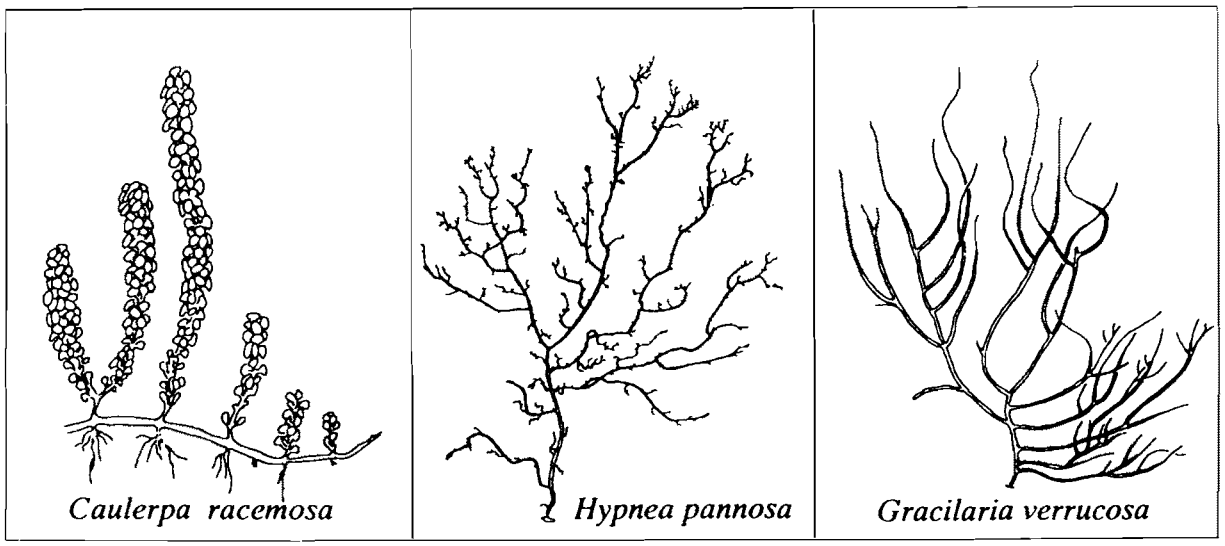


FIGURE 3. Examples of harvested seaweeds (South, 1993).

According to the fishers in Kaba the fishing catch is now a quarter of what it was five years ago. One of the older fisherman remembers the times when mullet catches from nearshore areas used to fill up the punts. In recent times, too many fishers are taking too much fish resulting in overfishing and decreasing catch. The fishing ground, as a result, has been severely depleted.

In 1995, given the national concern for the future of the fisheries resources, Adi Samanunu Cakobau, the head of the Kubuna confederacy, decided to allow gillnetting in the Kubuna waters only between January and June and to allow only line fishing between July and December when gillnetting is banned. This stand reflects the national concern associated with the global problem of depleting fisheries resources. The Fiji Fisheries

Division earlier this year banned coral exploitation on Viti Levu and turtle harvesting except when done for subsistence or for cultural purposes. In 1996, Adi Samanunu Cakobau decided not to offer any license to any commercial fisher and to allow only the fishers of Kaba Point exclusive use of the fishing ground.

The proper management and conservation of the fishing grounds surrounding the Kaba peninsular is becoming a hotly contested issue due to the extensive and varied uses and importance of the resources. There are a wide range of management concerns amongst the villagers. There is currently no Tui Kaba, Na Vunivalu installed in Bau and a number of people are now giving licenses that only the Tui Kaba, Na Vunivalu is entitled to do.

There is worry over the activity of licensed fishers. In an earlier incident in Waicoka one of the licensed fishermen it was alleged publically proposed and successfully pushed for the closure of gillnet fishing in the Kubuna fishing grounds only after he had secured the permit to fish in the nearby Dravo waters. According to the villagers, the licensed fisher by so doing ensured that no one else but he fished the Kubuna waters. This arrangement was possible because the licensee had worked out a scheme that would formally ban fishing in the Kubuna waters. Unknown to all others elsewhere, the licensee had set himself up and was having the best of two fishing grounds, including the Kaba waters. Having a license for a different but nearby fishing area the licensee was able to fish both areas by himself because he had a license to fish in a separate but adjacent area. It was alleged that under the cover of darkness, the licensee would move his operation to nearby Kubuna waters which were outside the area for which he has a permit.

The villagers are also weary of the fishers from Suva who go past the Kubuna fishing ground on route to their own fishing grounds. The villagers suspect some of these fishers of illegally fishing in their realm.

The fishing licenses inside the demarcated areas in the Kubuna waters are given by the chiefs in Bau. The licence holders share the fisheries resources with all the people that have customary rights. Often, the chiefs have little knowledge of fishing issues within their realm. Amongst the fishers, it is difficult to confront people who are selling coral or those engaged in questionable fishing because the people all have equal rights to these fishing grounds. As is the situation in such cases, no one is responsible for the management of the resource because the users are not fully known and everyone attempts to maximise his or her gain from the fisheries.

The Muaikaba Cooperative

The Muaikaba Cooperative was formed by the villagers in Dromuna after the Naitodua Cooperative that they had started with their relatives in Vatani, collapsed. The Muaikaba Cooperative which was set up with a $300 investment has been running for approximately 4 years. It continues to be plagued by problems such as those in other parts of Fiji. Although the villagers agree that the fisheries cooperative is providing a valuable service to the people in the purchase of their catch, the commitment of the members has not been forthcoming. The fact that the cooperative is around today is largely the work of a handful of members. One particular member, at the time of the study, held four positions

of responsibility within the cooperative. This member looked after the purchase and sale of ice, did the books (secretary), kept the money (treasurer) and arranged the sale of fish. This sad state of affairs has been arrived at because certain office bearers have not honoured their duty to the members of the cooperative. Although the secretary has been sent to training sessions, there has been no positive change in the persons attitude and performance.

The cooperative is in dire need of proper management. During the annual check conducted by the official from the government's cooperative section, the problem of proper book keeping was highlighted and blamed for the loss of $300 from the sale of petrol. The government officer also advised the Chairman to ensure that the office bearers performed their duties. The members of the cooperative were advised that it was important that the committee members meet regularly. The member with the four positions of responsibility fears for the future of the cooperative after he relinquishes all responsibility. This member explained how the cooperative was often like a personal venture. Asked as to the reasons for his commitment in the face of poor support from fellow members, he reasoned that he does not want to give the sceptic observers the amusement and satisfaction of seeing the project fail. According to this member, there are a lot of villagers only waiting to see the cooperative fail.

A number of years earlier, Muaikaba Cooperative with the assistance from the Fisheries Officers working in the area, were given an assistance worth $3,000 by the Forum Fisheries Agency. This assistance in the form of nets, rope and lead is treated as capital and is sold to members who can take these items on loan. The loan amount is recovered through deductions off the fishers fishing income.

In 1994 the Muaikaba Cooperative members earned a bonus of $1,070.50 which they re-invested as shares. The Muaikaba Fisheries Cooperative has the sum of $3,890 in fixed term deposit in the bank.

At the last annual meeting of the cooperative, plans for improvements were made. The ice box in use today is privately owned by one of the members and is in need of great improvement. The current shed is too small and unhygienic. In 1996, the cooperative opened a fully paid-for new fish shed and storage area after the 1995 annual meeting agreed to use the $800 they have at hand to improve on their ice box and shed and to purchase the benzine to allow resumption of this trade. The sale of benzine has been suspended for a number of weeks because of the credit problem.

There is a plan to have a building which also houses the community hall. This plan, however, is still being presented to government officials and departments in the hope that it may fetch external funding. There has been some re-organisation and there is hope that these changes will result in tangible improvement to life in Kaba Point.

The cooperative currently goes through about 10 54kg bags of ice a week. The ice is brought to the village every week after the sale of fish to the butchers in Nausori. Expenses on every marketing trip is about $100 - $40 for boat, $40 for ice and $20 for carrier. This expense doesn't vary with the catch as the costs remain the same regardless of the volume of what is taken. Given this situation, it is important that the members of the cooperative are encouraged to ensure that all the $100 paid for each trip are put to

good use by people providing enough catch to make the trip worthwhile economically. Very often this is not the case as the villagers provide too little fish for the ice kept by the cooperative, or worse, sell their catch to other buyers including the nearby Toberua Island Resort. The problem of credit was also a major concern. Members and some non-members have not been able to pay their gear and petrol taken on loan. This debt problem has been blamed for the tight cash flow situation.

Villagers that own outboard engines were more likely to fish in parts of the fishing ground far from the village. Those fishers that own no engines often fish in areas nearby. A problem that is common in these nearby fishing areas is the loss of catch to the dogs that get to the nets and catch earlier than the net owners. According to the villagers, the dogs at times swim to get to the partly submerged nets. Two cases of dog attacks were reported during our three nights stay in Dromuna. The fishers were a little late in checking their nets that had been placed in the sand and mudflat. In both instances, the catch was eaten by the dogs.

A problem faced in Kaba as in other Fijian villages was the conflict between tradition and economic consideration. In Fijian villages, the dichotomy is easily visible. Although people are reliant on fishing they are prevented by tradition from becoming full time operators. The consistency of effort that is often a prerequisite for success in artisanal fishing is therefore impossible in the village where the people are expected to devote time to community obligations. At certain times the people in the communities are asked to do community work which takes them away from their fishing activities. In other instances the people are expected to do their fishing in their own time. During our study tour the villagers were in the village most of the week. The men were assisting a government team that was in the village to do some additional electrical wiring on some of the houses. On the day we went to Vatani the villagers waited for us the whole morning. We arrived after midday and were with them until late that night. On such occasions little fishing is possible.

In addition, there was the issue of villagers catering for visitors to their villages. Our host looked after us for the whole time we were in the village and used all of his catch to cater for us. When we left the village at the end of our stay, our host who had provided well for us, was apologetic because he was not able to give us fish to take home. Our host who has hosted many other visitors to the village, was still practicing the tradition of presenting offerings to departing family members, friends and visitors. According to a long time visitor to Dromuna our host has freely given away a lot of fish to the visitors that come to his village. These points illustrate the difficult position villagers are in. These are some of the important considerations that people who intend to better understand the economic situations in Fijian villages should keep in mind.

The villages in Vatani want to re-establish the Naitodua Cooperative after they have finished working on their church building. Fish from Vatani is at the moment individually sold smoked or fresh. Some seven people from Vatani are employed in the hotel on Toberua.

The reliance on fishing is quickly evident in Dromuna. Gillnets are used extensively. The nets are placed at high tide and are checked at lowtide. The retrieval of nets is conducted in the following high tide. Nets are taken from one place to another within the

fishing ground depending on the fisher's knowledge, experience and skill. On our first afternoon in the village, most of the villagers were with us in the village hall. However, at about 4.30 pm when the tide was high, four punts left the village. The punts returned about two hours later after having placed their nets. The nets were checked and retrieved around 6.00 am the following morning.

On one such morning trip, one of the researchers went with a fisher to check his nets which had been placed the previous afternoon. This person has approximately 380 metres of fishing net. One hundred and eighty metres of the nets which came in lengths of 100, 50 and 30 metres were placed in the deep areas along the passage and caught very few fish. The other net a two hundred metre shallow area net was the only one that caught some fish that allowed for our subsistence that day. In total we returned home with only 17.4 kg of assorted fish (APPENDIX 1). The other villagers also did not have a good catch during our stay. The catch was too low to be sold and was too poor to pay for the expenses.

At the moment, the cooperative buys fish, lobsters and crabs. Attempts are being made to diversify the commodities and look for new markets. Beche-de-mer is currently not traded for at the Muaikaba Cooperative because the market in both Nausori or Suva has not been identified. Certain issues such as grading, price and quality control are currently being discussed. The people are hoping for new markets so that they can turn to these commodities and free up the fish and other intensively used products. The people are now fully aware of how market forces take effect and are considering making some future plans for any additional development.

Kubuna waters is big but is shared and used by all villagers along the coast who need to be conscious of the importance of properly using the resources. Fish poisoning was at one time banned. The villagers in Kaba are suspicious that other villagers are not adhering to the prohibition. The people of Kaba do not practice fish poisoning.

I. A PRELIMINARY SOCIO-ECONOMIC STUDY OF KABA POINT

This following report is the result of a preliminary interview with eight women each in Dromuna and Vatani villages, personal observations and interview with the Cooperative Department officer in the village. The women who were chosen at random. Discussions were also carried out with the fishermen to allow an insight into the socio-economic situation in the village. Household interviews were conducted during the study to find out about the families living standards and the type of activities carried out by the family members. This information would provide a useful background for more detailed studies in the future.

Dromuna

General

Dromuna village consists of five *mataqalis* (clan) and nine *tokatoka* (extended families) and is part of Bau, Tailevu province and the Kubuna confederacy. The five *mataqalis* in the village are Nukulau (chiefly clan), Naitodua, Nasivou, Muaikaba, and Korolevu.

The village consists of 23 households with 10 concrete, 9 wooden, 2 bures and 2 corrugated iron houses. There is no direct source of fresh water supply. The villagers collect rainwater in drums and wash in a nearby pool. There are two community water tanks to supply drinking water. The supply of electricity was from the village generator and the supply was being facilitated during the time of study. The village has a new church and the old one is now being used as the community hall. There is one co-operative store where all villagers are shareholders.

There is a primary school and a community health centre in the village. The health centre is poorly equipped. Most of the villagers go to the hospital either in Nausori or Wainibokasi.

Dromuna is accessible by boat from the Nakelo Landing or from Mataidreketi. The cost for a return trip during the time of the study was around $40.00. Passenger fare is $10.00 return for people with cargoes and $4.00 return for those with no cargo.

There were five non-motorised punts in Dromuna and ten with outboard engines at the time of our study. The villagers can also hire punts from Ram Singh & Sons store at Nakelo if they wish to use these during their fishing. A punt is available for hire at $2.00 a day or $12.00 per week.

Population

The village population was around 91 with 100 people recorded as working and living away from the village (National Census,1994). During the study period, the village population was estimated at 95. The population structure is given in Table 1. (Provincial Council Census, 1994)

TABLE 1. Population of Dromuna

Age group	Male	Female	Total
0 -5 years	8	6	14
6-15 "	5	13	18
16-20 "	4	3	7
21-54 "	29	15	44
55+	3	5	8
Total	49	42	91

The lower numbers of villagers in the 16 - 20 age group indicates that most village children and young adults live elsewhere presumably attending schools or looking for paid employment. Further study is needed on the number of these people who return, and their ties with the village and its systems.

Agriculture and Land use

Most of the village land is hilly and covered with forest and patches of land under shifting cultivation. Plots for individual households are scattered in different places within the *mataqali* land. A plot is kept by a household for a number of years depending on soil fertility and crop type. Most villagers own breadfruit trees which have either been planted on their piece of allotted land or had grown on it naturally. Other crops include mangoes *(Manqifera indica)*, kavika *(Malay apple) (Syzygium malaccense)*, coconuts *(Cocos nucifera)*, avocado pears *(Persea americana)*, cassava *(Manihot esculenta)* , plantain *(Plantago major) (Musa balbisiana)*, yams *(Diocorea alata)*, bananas *Musa nana)*, dalo *(Colosia esculanta)*, bele *(Abelmoschus manihot*, sweet potatoes *(Ipomoea batatas)*, ivi *(Dioscorea alata)*, duruka *(Saccharum edule)*, and peppers *(Capsicum annum)*.

The subsistence fishers who do not own boats spent more time in their gardens than those who owned boats and nets. Agriculture provides a subsidiary source of income for the villagers. Occasionally coconuts *(Cocos nucifera)*, cassava *(Manihot esculenta)*, sweet potatoes *(Ipomoea batatas)* and plantains *(Plantago major)* are sold. Kavika *(Malay apple) (Syzygium malaccense)* and mangoes *(Manqifera indica)* are sold when in season. Even though there is limited arable land, there is the need to clearly assess the potential contribution of commercial agriculture to the village economy. The clearing of large areas of bushes can lead to massive soil erosion and possible land slides. Some households also owned chicken and pigs.

Tourism

Tourists visit Dromuna from the Toberua Island Resort. The visits are organised on Mondays every fortnight. The whole village participates in entertaining the tourists. People also sell handicrafts and shells. The funds received from these visits are used in

the village projects while proceeds from individual sale of items is kept by the households. The level of income derived from such activities should be measured against other sources of income to determine the level of reliance on the resort. About six villagers are employed at the Resort.

Village Fisheries

Seventeen out of twenty three households are registered as members of the Muaikaba Fishing Co-operative. From the Co-operative records only about 5 members have been regular fishers while the rest have been quite sporadic in supplying fish to the Co-operative. It was difficult to determine whether some fishermen by-passed the Co-operative and sold directly to middlemen or at the market or alternatively, because of low catch levels, did not have sufficient surplus catch to sell.

Men basically carry out fishing from boats using handlines, spear guns and gill nets. Gillnets were by far the most common fishing gear used. Nets are set or placed at high tide and retrieved at the next high tide. Women are also active fishers in the village, both in terms of supply of food for the household and in selling marine produce as a source of income. Women either glean at low tide or dive from punts. In many households, both husband and wife carry out their respective fishing operations together. A more detailed analysis of the fishing activities of both, men and women is needed in order to determine the level of effort and inputs into the fishery and the level of production or output. Such information can provide a better insight into the productivity of the fishers, and the potential for fisheries development.

Vatani Village

The study teams visit to Vatani village was short. Much of the information gathered was over lunch and through informal interviews with the women in the individual households.

General

Vatani village has a population of 192. An additional 219 people work and live outside the village. There are 28 households which consists of 14 concrete houses, 10 wooden, 12 corrugated iron and 3 *bures*.

Like in Dromuna, there is no source of fresh water supply except for a communal bath pool which the villagers claim is a natural spring. Drinking water is stored in drums and communal water tanks. The village has a radio-telephone service and a community hall. A new church was under construction during the time of visit. There are two individually owned stores in the village. Transportation problems and expenses in Vatani are identical to those mentioned by the people in Dromuna.

The children from Vatani attend the primary school in Dromuna. An inland bush track between the two villages is used by the villagers. The walk takes about 10 minutes.

Population

The village population structure is given below:

TABLE 2 Population of Vatani

Age Group	Male	Female	Total
0 -5	11	10	21
6-15	33	20	53
16-20	11	-	11
21-54	36	40	76
55 +	12	19	31
Total	103	89	192

The population features are similar to those of Dromuna where most of the teenage and young people from 16-20 live outside the village.

Agriculture and Land Use

In Vatani, the land area used for cultivation appeared to be larger than the area in Dromuna. In some areas flat and slightly hilly land was used more intensively. The variety of crops cultivated were similar to that in Dromuna. However, more land was cleared for taro and yaqona cultivation. From the household discussions, it was apparent that agriculture was an important source of subsidiary income for many households in Vatani.

Most women indicated that they usually took agricultural crops together with marine food to sell at the market.

Tourism

Tourists from the Toberua Island Resort visit Vatani on alternate Mondays. The village prepares tea and entertainment for the tourists and receives $100 per visit. The money goes to the community funds to upgrade village facilities. Individual households sell handicraft and shells to tourists when they walk around in the village.

Village Fisheries

The village fishermen initially belonged to the Naitodua Fishing Co-operative which was formed on 1963 with the Dromuna villagers. However, the Vatani villagers pulled out due to conflicts over the management of the co-operative. This co-operative eventually collapsed in 1989. The members from Vatani have formed a fishing group and have plans to set up their own co-operative. Details on how this fishing group operates and its

viability could not be obtained during the limited time of the study. In Vatani, women are quite active fishers in terms of providing food and income for the family. The main focus of the women and many household fishing operations is the collection of sea cucumbers and sea weeds. There is also some coral extraction and several younger village men are involved in this activity.

There were seven punts with outboard engines in Vatani. Men mostly carry out fishing with nets and handlines. The use of handlines by Vatani fishermen seems greater than the case for the Dromuna fishermen.

Women dive for seaweeds and sea cucumbers using goggles. Women are responsible for selling the catch at the market. They sell a variety of marine products including smoked fish, octopus, seaweeds, sea cucumbers, crabs, and prawns. The village also has two large fish fences which are checked at low tide mostly by women.

An Analysis of the Proposed Muaikaba Fishing Co-operative

The aim of this exercise was to look at the feasibility of the proposed co-operative project (Table 3). The analysis involved looking at the co-operative records on purchases, sales and financial statements. The co-operative officer from Nausori was also interviewed. Discussions were held with the manager and the treasurer of the co-operative as well as some of the members and other villagers.

History

In late 1992, a group consisting of members from Dromuna Village formed the Muaikaba Fishing Co-operative using their shares from the previous co-operative.

Present Status

There are seventeen (17) registered shareholders and the total funds as at the 14th of February 1995 was $7,900.73. This consisted of $3,143.35 as members funds, $2,704.80 as aid from the Forum Fisheries Agency (FFA), $1,522.53 as share capital and $530.05 as General Reserve. Savings in the bank for the same period was $3,869.50.

The Co-operative does not have an office building. Catch is recorded in a storage shack located near the seawall. Inside the shack, there is a weighing scale and two old freezers which hold ice bought from Nausori. The catch is kept on ice in these freezers until Saturday morning or until enough catch has been accumulated to justify a trip to the market. The treasurer weighs the catch brought by the fishermen and pays them according to weight and species.

The Muaikaba Co-operative had submitted a proposal for a capital grant to the Poverty Alleviation Fund. This was not successful because the project was considered to be outside of the scope of the Fund and the village did not provide evidence of poverty. However, the village is still keen to pursue the project. Discussions with village elders indicated that they perceived this as the most important form of assistance to improve

the income levels of the villagers. The proposal is the same as when it was submitted to the Poverty Alleviation Fund. A preliminary financial and economic analysis of the project has been carried out to determine the feasibility of the project.

Analysis of the Proposed Project

The project will involve the whole village which consists of 23 households. With the project, fishermen will be able to stay longer at sea and cover wider fishing grounds. Ice would be readily available and fishermen can sell their catch to the co-operative when ever they want.

It is assumed that production would double from the current level while operating costs would increase by one third because more fuel would be required. The average price of fish paid to fisherman is about $2.50 per kg based on the current average domestic wholesale market price for fresh reef fish. The average level of catch is projected as 574 kg per fisherman per year which has been estimated from 1993 and 1994 production levels. From the estimates, the gross annual income per fisherman is calculated to be $1,435. Average total cost is around $663.00 which gives an average net income of $772. Details on production, cost and revenue calculations are given in APPENDIX II.

The opportunity cost for the subsistence fisherman would be $301. For a member of the cooperative operating a motorised punt, and using gill nets, the opportunity cost would be $137. This represents the costs that an individual fisherman has to forego in order to become part of this new project. This would give $471.00 as net benefit to a subsistence fisherman and $635 as net benefit to a current co-operative member as they would both derive an average annual income of $772 by implementation of the project. These incremental costs and revenue details are given in Table 4. Loss of benefits derived from other subsistence activities such as agriculture could not be determined due to time constraints but these were considered marginal in terms of having any major impact. All fishermen ensure that the family receives adequate supply of fish as a practice and this would continue even if they join the co-operative.

If the $74,000 capital cost is financed by the government as a straight grant, the co-operative members would be able to operate and manage the terminal with an annual operating cost of $8,250. This would increase the cost per fisherman by $358.70 which would in turn reduce the real net benefit to $276.30 for co-operative net fisherman and $112.30 to subsistence fisherman. However, if the terminal is able to break-even with income derived from use of its services and facilities by others and with a mark-up of 10 percent on fuel, $0.14 per kg on ice sales, and a $0.50 per kg on fish sales through the co-operative, then the net benefit for all fishermen would be higher. It would be closer to $471 for subsistence and $635 for co-operative net fishermen. Details on terminal operating costs are given in Table 5.

Other indirect benefits from the project would be the use of cold storage for storing other perishable goods by the villagers. With the project, other village members can also participate in fishing as the market would be readily available. With ice being readily available, fishermen can extend their fishing areas and relieve fishing pressure in over-exploited areas closer to their villages. If a viable co-operative exists and villagers are able to derive a means of support, the urban drift would not be a problem as school

drop-outs and others can participate in the fishing activities. The major indirect cost would be spending longer periods of time at sea fishing. Thus villagers would have less time to attend to their gardens and other communal and social activities. This may also have an impact on the division of labour within the household. Those household members not involved in fishing may attend to the gardens so that the net economic loss from subsistence agriculture would be marginal.

The proposed project is not economically viable even if production doubles and costs increase by only one third from the current level given that fishermen's investment into boat and gear remain the same. This is because the NPV (Net present value) is negative. This is calculated in Table 6. The financial benefits over costs is equal to 0.68 which means that the project under the given circumstances is not viable as the costs outweigh the benefits. For the co-operative to be successful, it is necessary that it becomes financially viable. Details of financial analysis is given in Tables 3 - 6. It is assumed that the terminal with all its assets would have a useful life of eight years. This is based on the experience of similar co-operative projects (Turaganivalu, pers.comm).

Considering the performance of fishermen from the co-operative (as indicated in part C) and given the socio-cultural situation in the village, the desire to increase income levels and to keep traditional social and cultural practices, need careful planning in order to achieve a balance or an acceptable level of compromise. The planning authority and the people of Kaba need a clear vision on the type of development they desire that would improve their welfare and long term sustainability.

The following is a preliminary analysis of the feasibility of the proposed Muaikaba Fisheries Terminal Project:

TABLE 3

Proposed Musikaba Fishing Co-operative Capital Cost

	$
Storage Building	16387.01
Combination freezer/coolroom	33000
Generator - 15KVA 3 Phase	11000
Fibre glass boat/engine	7133.5
Salter scale (2)	1514.6
Capital funds requested	69035.11
Working Capital	5000
Total Funds requested	**$74,035.11**

TABLE 4.

Musikaba Fishing Co-operative Project
Production (catch), Average Income, Operating Cost and Incremental Income

Fishery Type	Average annual catch (kg)*	Average gross annual income* (price = $2.50)	Average operating cost ($)*	Average annual net income ($)	No. of fishermen (with Project)	No.of fishermen (without Project)	Total incremental net income ($)
Type A: fishermen with motorised punts, use of nets, lines, spear guns (co-op members)	382	955	818	137	0	17	2329
Type B: Semi-subsistence, irregular use of punts	192	480	179	301	0	6	1806
Type C: similar to Type A but	574	1435	663	772	23	0	17756
Type A: with more deep-sea line fishery, extended fishing grounds some use of nets					23	0	13621

* Details in APPENDIX II

TABLE 5

Terminal Operations upon completion of the Project

Fish landings :

Total annual catch of multi-species fish
23 fishermen x average catch of 574 kg = 19202 kg (13.2 tonnes)

INCOME	$	
Fish price mark up @ $0.50/kg		$6,601.00
Sale of ice($0.14/kg of total sales)		$1,848.28
Sale of fuel (mark -upp of $0.10/lit)		$1,299.14
Rent of equipment/ miscellaneous use by fisherwomen & other villagers		$12,570.00
		$22,318.42

OPERATING COSTS	$	
Generator fuel & maintenance		$2,000.00
Manager/operator		$2,000.00
Fuel for co-operative punt		$2,000.00
Carrier transport to market		$1,000.00
Repair & replacements		$500.00
Contingency 10%		$750.00
		$8,250.00
Capital servicing cost (imputed): $70000.00x0.201 (Capital recovery factor for 8 years at 12%)		$14,070.00
TOTAL COST		$22,320.00

* notes to estimation of income is presented in APPENDIX III

TABLE 6

Musiitaba Fishing Co-operative Project

Discounted Cash Flow Analysis

Total capital cost		$74,000.00
Annual operating cost		$8,250.00
Average annual Revenue		$13,621.00
Discount factor		12%
Expected life	8years	

Year	Total Capital cost	Terminal operating cost	Total cost	Revenue	Net cash flow	NPV
0	$74,000.00	0	$74,000.00	10215.75	($63,784.25)	($56,950.22)
1	0	$8,250.00	$8,250.00	$13,621.00	$5,371.00	($52,668.49)
2	0	$8,250.00	$8,250.00	$13,621.00	$5,371.00	($48,845.52)
3	0	$8,250.00	$8,250.00	$13,621.00	$5,371.00	($45,432.16)
4	0	$8,250.00	$8,250.00	$13,621.00	$5,371.00	($42,364.51)
5	0	$8,250.00	$8,250.00	$13,621.00	$5,371.00	($39,663.39)
6	0	$8,250.00	$8,250.00	$13,621.00	$5,371.00	($37,233.82)
7	0	$8,250.00	$8,250.00	$13,621.00	$5,371.00	($35,084.57)
8	0	$8,250.00	$8,250.00	$13,621.00	$5,371.00	($33,127.73)

Net present value of cash flow at 12 % = $ -(33,127.73)

NPV < 0

TABLE 7

Musiitaba Fishing Project
Cost-Benefit Ratio Analysis

Year	Total cost($)	Total Benefit ($)	Discounted cost ($)	Discounted Benefit ($)	
0	$74,000.00	10215.75	$66,071.43	$9,121.21	
1	$8,250.00	$13,621.00	$72,648.28	$19,979.78	
2	$8,250.00	$13,621.00	$78,520.47	$29,674.94	
3	$8,250.00	$13,621.00	$38,331.33	$38,331.33	
4	$8,250.00	$13,621.00	$88,444.76	$46,060.25	Discounted Benefits / Discounted costs
5	$8,250.00	$13,621.00	$92,624.47	$52,961.08	
6	$8,250.00	$13,621.00	$96,356.35	$59,122.53	0.677317101
7	$8,250.00	$13,621.00	$99,688.99	$64,623.82	
8	$8,250.00	$13,621.00	$102,663.42	$69,535.69	0.68<1 : The project is therefore not viable under the given condition
	$140,000.00	119183.75			

TABLE 6

Musaitaba Fishing Co-operative Project
Sensitivity Analysis (Sales increase by 20%)

Year	Total cost ($)	Revenue ($)	Net Cash Flow ($)	Discounted cash Flow ($)
0	$74,000.00	12258.9	($61,741.10)	-($19,220.59)
1	$8,250.00	$16,345.20	$6,095.20	
2	$8,250.00	$16,345.20	$6,095.20	
3	$8,250.00	$16,345.20	$6,095.20	
4	$8,250.00	$16,345.20	$6,095.20	
5	$8,250.00	$16,345.20	$6,095.20	
6	$8,250.00	$16,345.20	$6,095.20	
7	$8,250.00	$16,345.20	$6,095.20	
8	$8,250.00	$16,345.20	$6,095.20	

* Revenue is increased by 20%

TABLE 9

Musaitaba Fishing Co-operative Project
Sensitivity Analysis (Costs down by 30 %)

Year	Total cost ($)	Revenue ($)	Net cash Flow ($)	Discounted cash flow ($)
0	$74,000.00	10215.75	($63,784.25)	-($22,150.13)
1	$5,775.00	$13,621.00	$7,846.00	
2	$5,775.00	$13,621.00	$7,846.00	
3	$5,775.00	$13,621.00	$7,846.00	
4	$5,775.00	$13,621.00	$7,846.00	
5	$5,775.00	$13,621.00	$7,846.00	
6	$5,775.00	$13,621.00	$7,846.00	
7	$5,775.00	$13,621.00	$7,846.00	
8	$5,775.00	$13,621.00	$7,846.00	

* Operating cost decrease by 30%

TABLE 10

Musikaba Fishing Co-operative
Sensitivity Analysis
Increase in Discount Rate by 25%

Year	Total Cost ($)	Revenue ($)	Net Cash Flow ($)	Discounted Cash Flow(15%)
0	$74,000.00	10215.75	($63,784.25)	-($34,506.82)
1	$8,250.00	$13,621.00	$5,371.00	
2	$8,250.00	$13,621.00	$5,371.00	
3	$8,250.00	$13,621.00	$5,371.00	
4	$8,250.00	$13,621.00	$5,371.00	
5	$8,250.00	$13,621.00	$5,371.00	
6	$8,250.00	$13,621.00	$5,371.00	
7	$8,250.00	$13,621.00	$5,371.00	
8	$8,250.00	$13,621.00	$5,371.00	

AN ANALYSIS OF FISHERMEN'S PRODUCTION LEVEL AND EFFORT

This part of the study involves an analysis of the co-operative records on purchase from individual fisherman and the revenue received by the fishermen.

Total catch recorded by the co-operative and revenue received by fishermen is given by months for 1993 and 1994 in Graph Ia. and Ib. Both graphs reflect the variability in level of catch throughout the year. Production in 1994 indicates an overall decline of 19 percent () over 1993 production. Revenue is highly variable and reflects the variable price level of the diverse species sold to the co-operative.

Due to time constraints, it was not possible to document monthly details on performance by individual fisherman throughout the year. Records from the co-operative were available from mid 1992. The months of April and December were chosen for a more detailed analysis of weekly performance by fishermen. April was considered to represent production situation during the early part of the year whereas December reflected production during the later part. Graph II (a-f) indicate the total weekly catch and revenue by individual fisherman over the months of December, 1992; April, December, 1993; April, December, 1994. A list of fishermen engaged in fishing and selling their catch to the co-operative was arranged alphabetically. For the purpose of analysing their performance, every fourth fisherman's records was analysed.

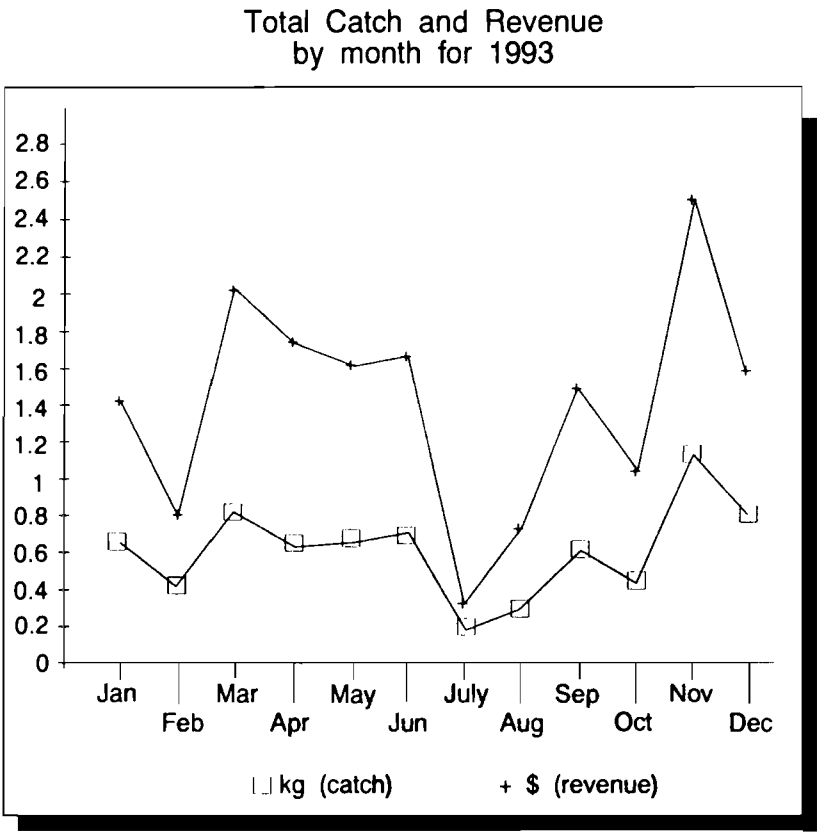
From the weekly performance, only fisherman (d), (e) and (f) indicate some reliability in their production. Fisherman (a) and (c) have only sold fish in April, 1993. Fisherman (b) on the other hand operated in December of both 1992 and 1993 and did not sell any fish to the co-operative during April and December of 1994. The weekly performances from the graphs indicate that majority of the fishermen fish and sell to the co-operative consistently over short periods of time and then do not sell to the co-operative for extended periods of time. There could be several reasons for this behaviour. One could be that they sell only when there is an urgent need for cash, secondly, the co-operative probably does not offer the optimum price for their catch, thirdly and seems most likely is that they do not have sufficient surpluses in order to sell. A more detailed analysis on the nature of their practices is needed in future studies to determine the reasons for current practice and potential for operating a co-operative.

Graph III (a-j) illustrate the total catch and revenue by individual fisherman per month of the study period (December, 1992; April, December, 1993; April, December, 1994). Every third fisherman was selected from a list of fishermen arranged alphabetically. In terms of monthly performance, Fisherman (a), (b), (f), and (j) only indicate consistent level of fishing and supplying fish to the co-operative. Fisherman (c), (d), (e), (g), and (i) although members of the co-operative, have only sold to the co-operative on a irregular basis.

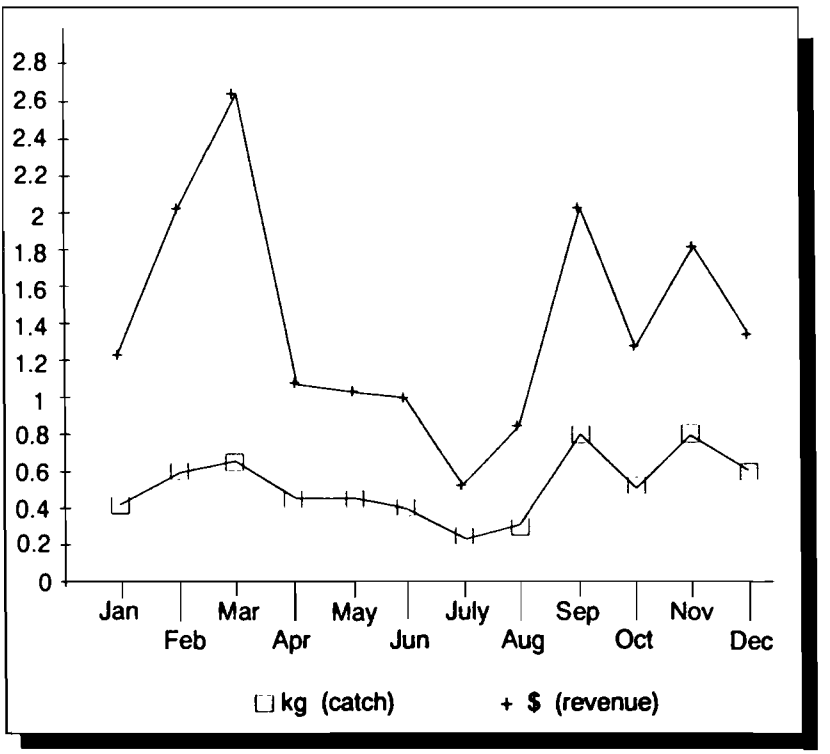
The level of catch in (kg) to the co-operative and revenue in ($) received by fishermen can be derived from the given graphs.For the co-operative to be viable, individual members need to be more reliable and supply regularly. However, this may not be a socially optimal type of decision.

Total Catch Received by the Co-operative and Revenue Received by Fishermen

Graph I (a)



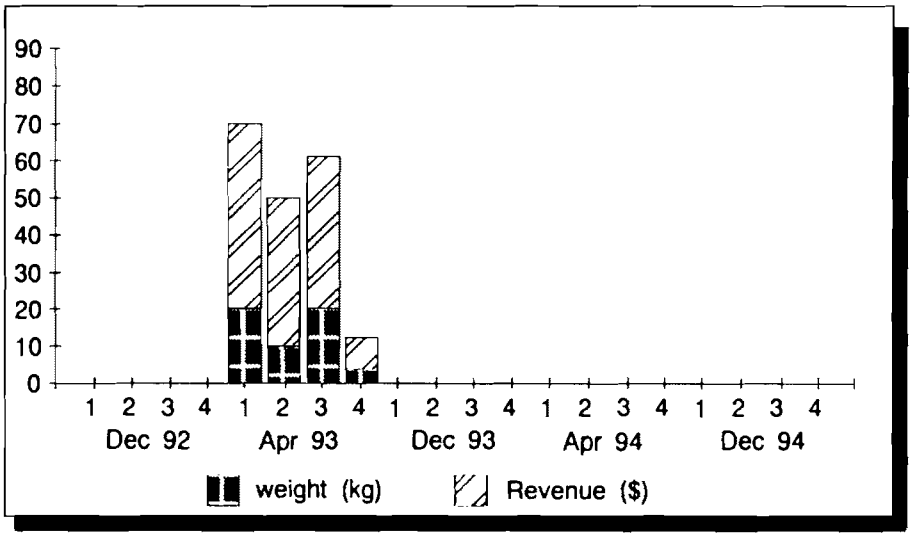
Graph I (b)



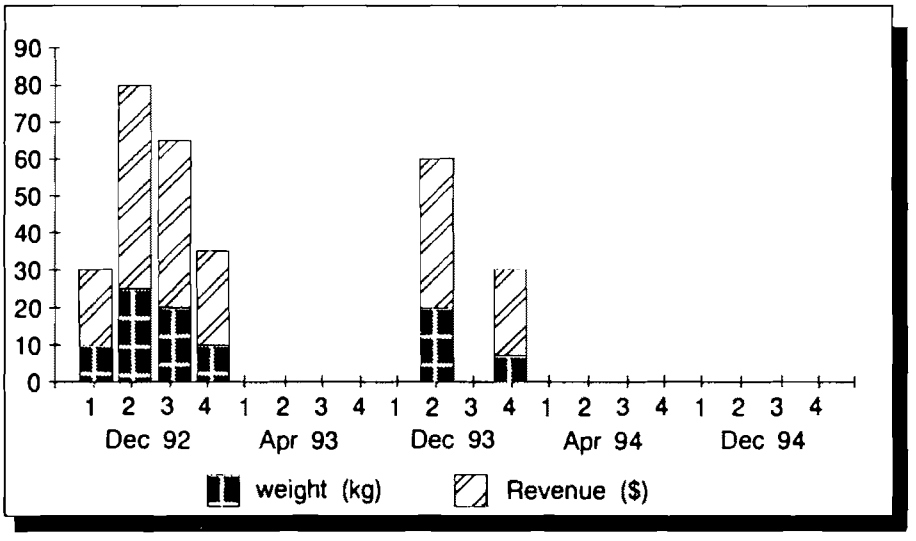
Weekly Performance by Individual Fishermen during the Months of December, 1992; April, December, 1993; April, December, 1994

Graph II (a-f)

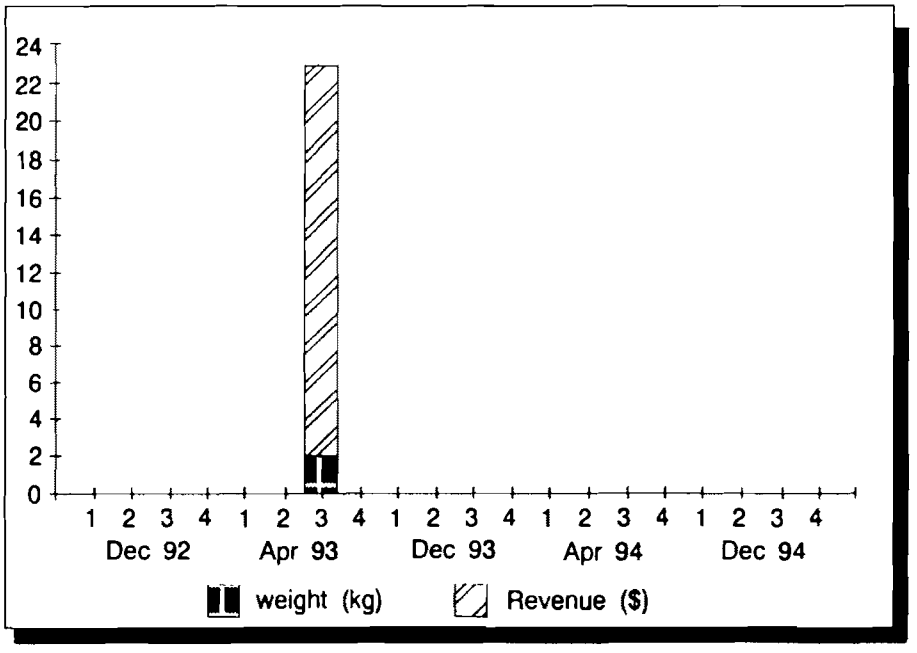
Fisherman A



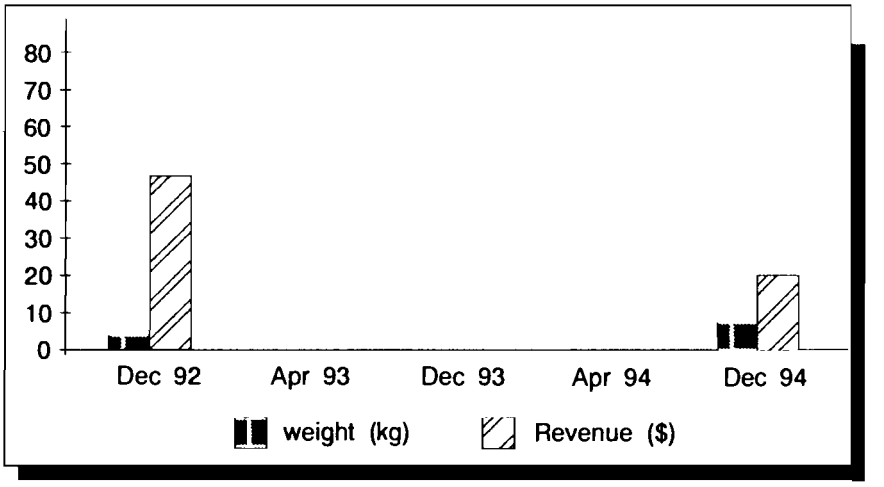
Fisherman B



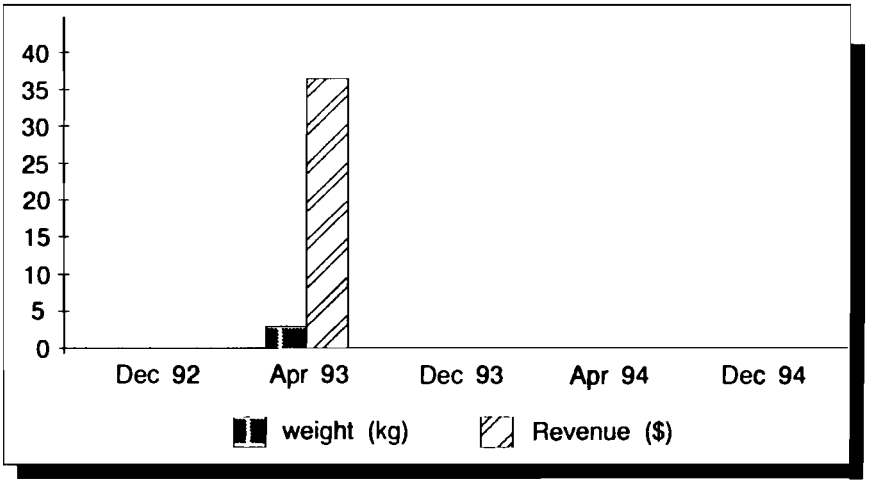
Fisherman C



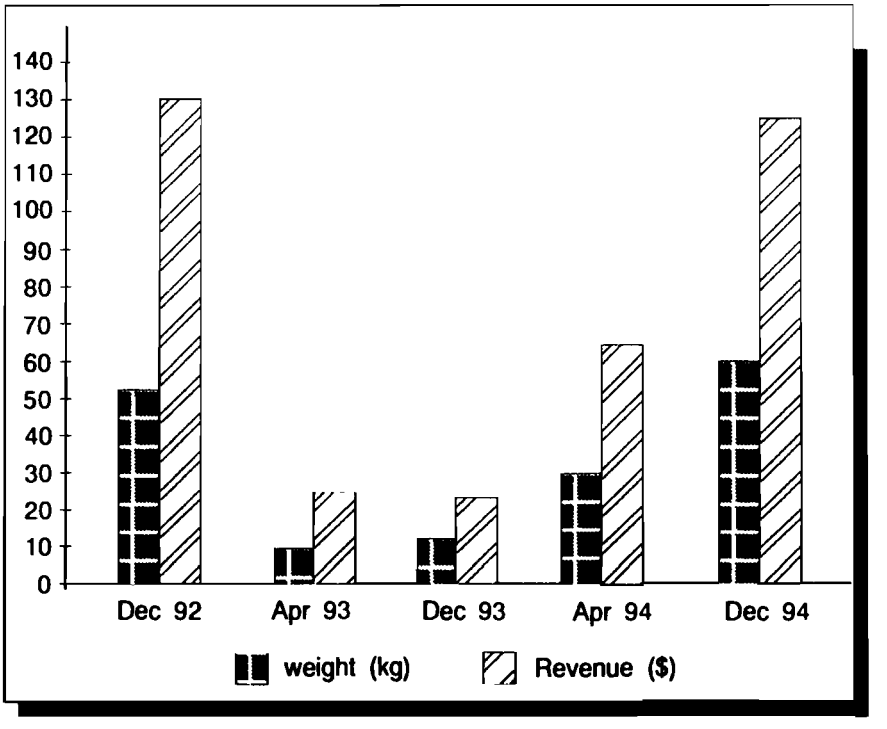
Fisherman D



Fisherman E



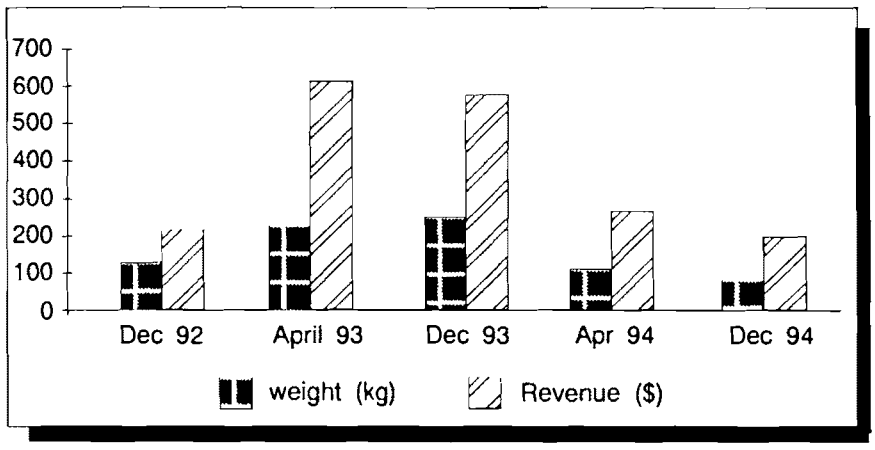
Fisherman F



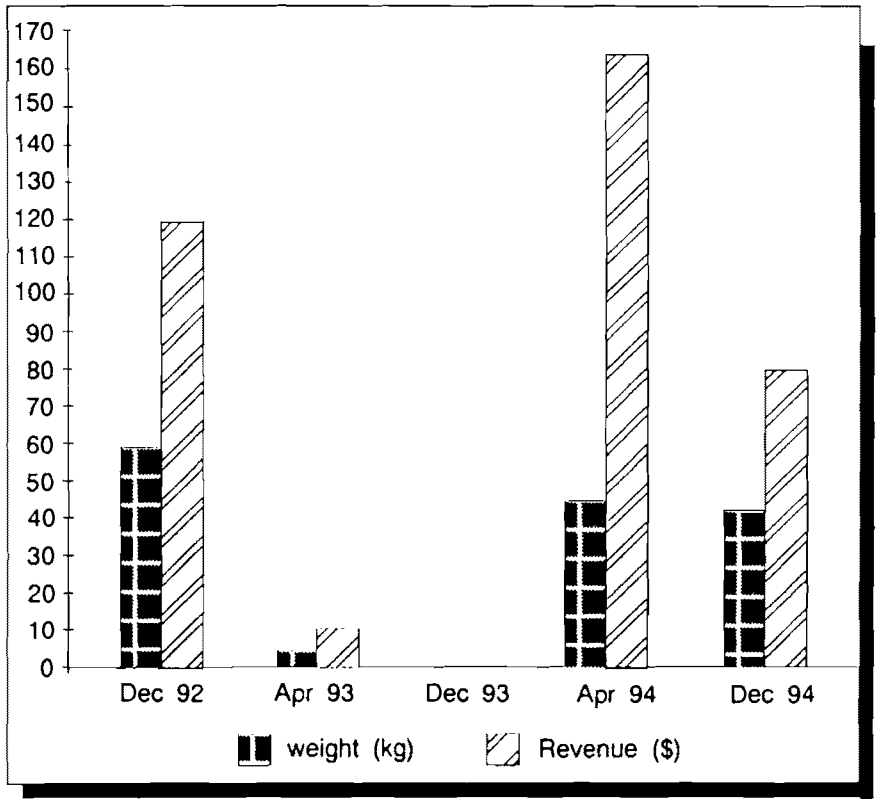
ly Performance by Fisherman over the Selected Period (Dec, 1992; Apr, Dec, 1993; Apr, Dec, 1994)

h III (a-j)

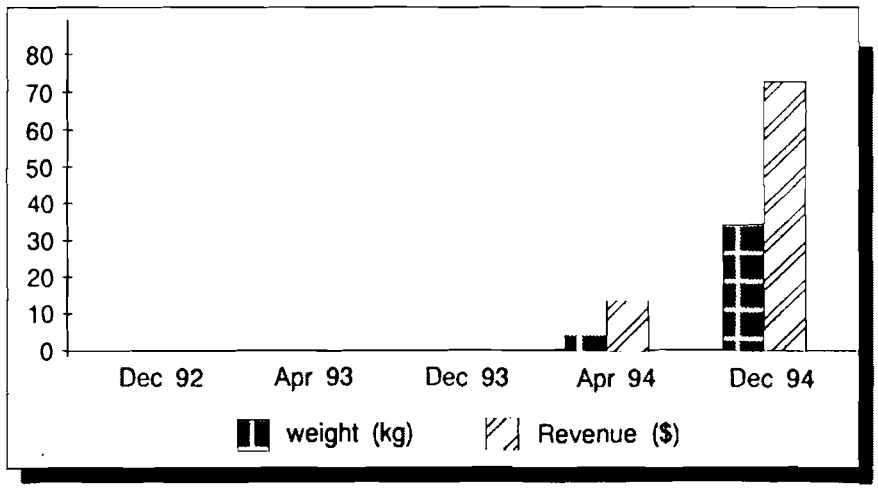
Fisherman A



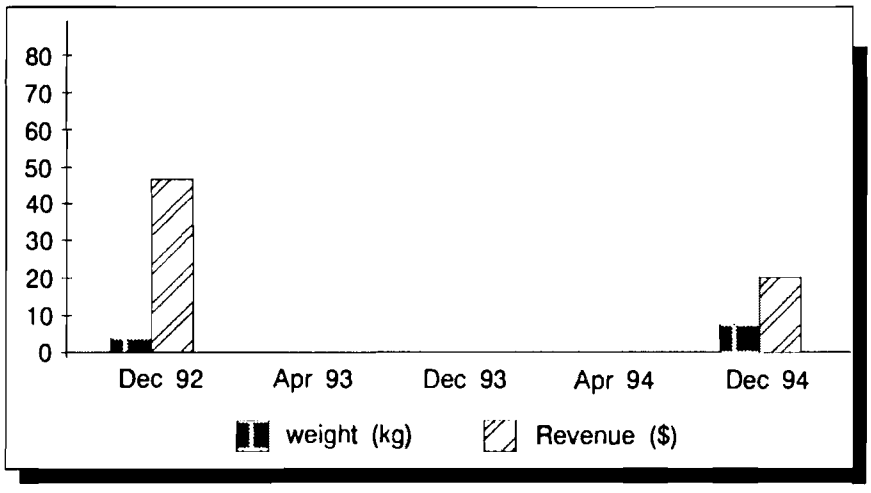
Fisherman B



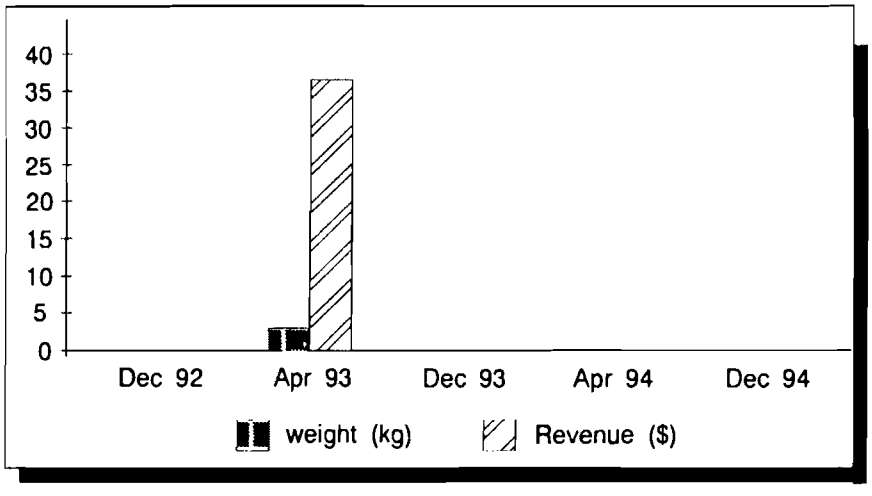
Fisherman C



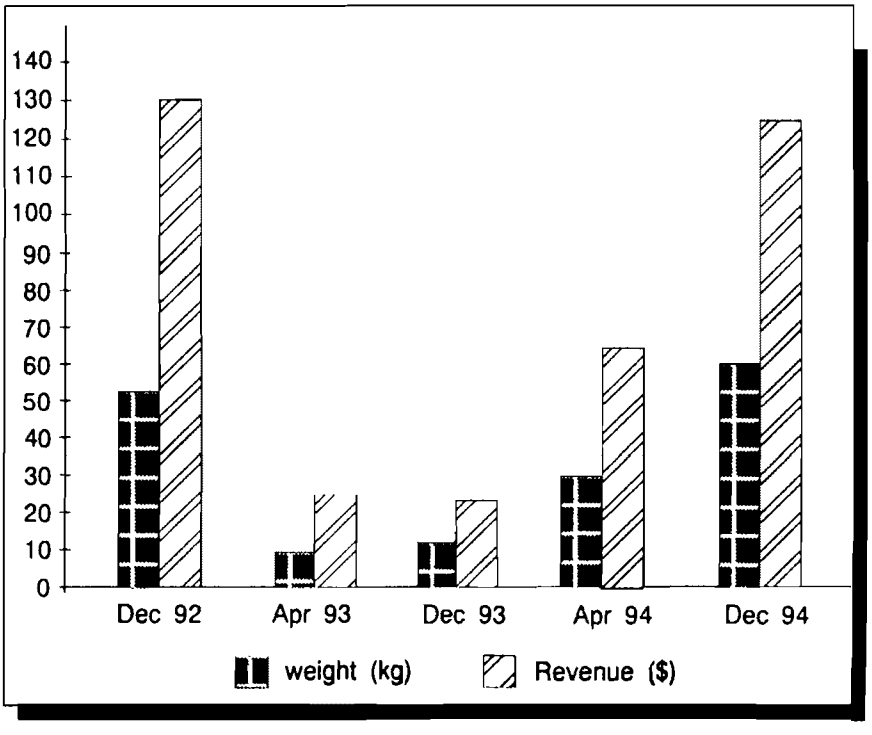
Fisherman D



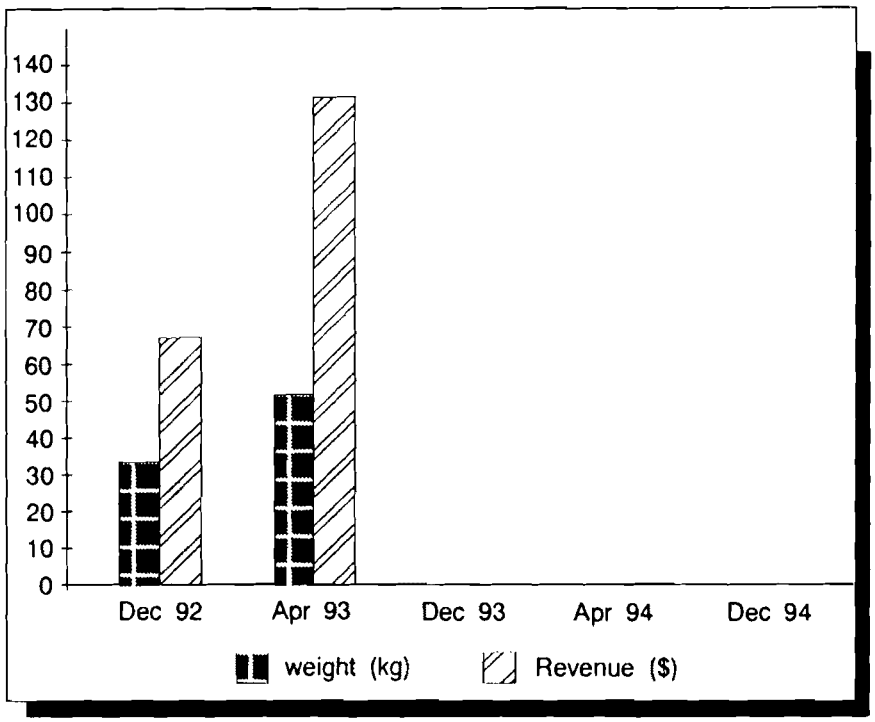
Fisherman E



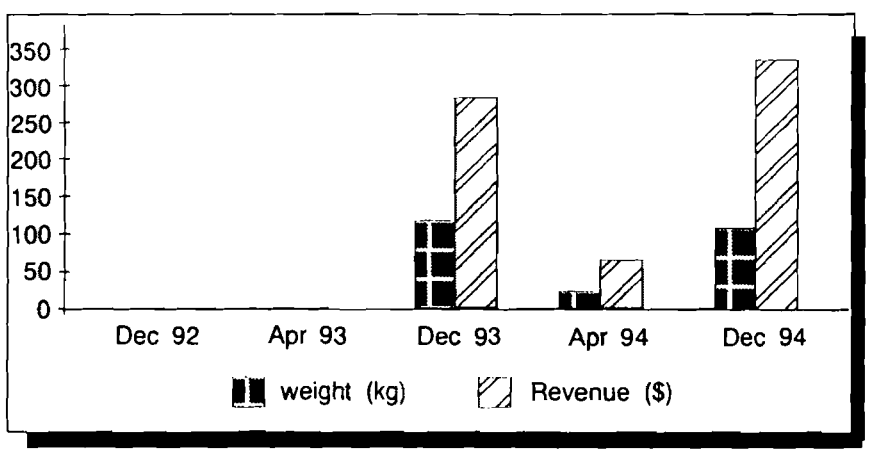
Fisherman F



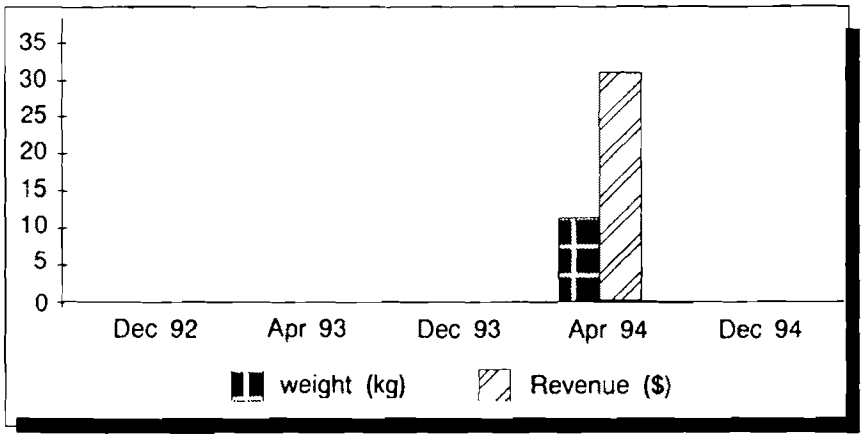
Fisherman G



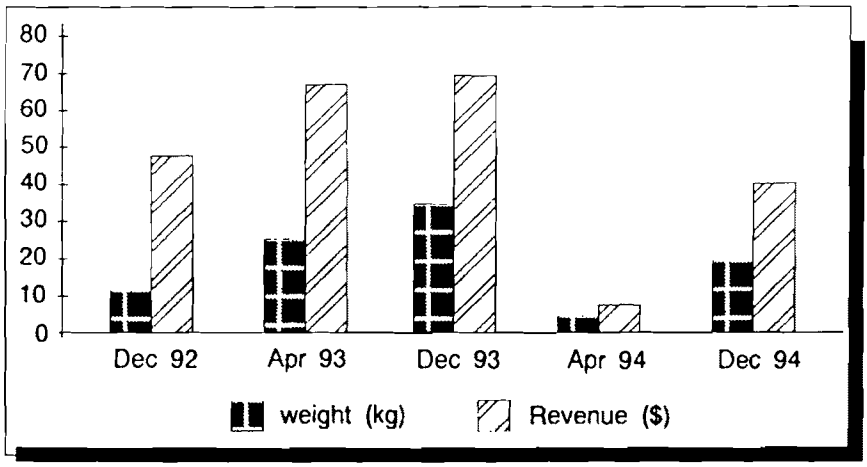
Fisherman H



Fisherman I



Fisherman J



CONCLUSION

Based on the information gathered from the records kept by the co-operative and discussions held with various people during the field study, it was evident that the villagers do not have a clear vision on the role of the co-operative in the village.

Although it was apparent to the villages that the co-operative would function as a profitable enterprise if its members were fully committed, in practice only a handful of people in the village were truly concerned about its successful operation. These people included those who were more reliable suppliers to the co-operative and therefore received more regular income from selling their fish. One could safely say that all villages supported the idea of having a co-operative at least as a ready market if and when they needed to utilize its services. Others saw the co-operative as a means of investment but did not necessarily see themselves as active participants.

Several factors some of which were identified during the study and are listed below contribute to this sort of attitude in the village. However, it was difficult to identify to what extent each of these given factors influenced the individual villager's association with the co-operative:

- From the preliminary resource surveys and records on catch and effort levels, it seems that villagers face a problem of over exploitation in their immediate fishing grounds. This can also be a contributing factor to the variability and low levels of catch sold to the co-operative. The low catches as observed in APPENDIX I indicate that there is limited surplus for sale.

- On the other hand, the availability of inputs such as fuel, ice, access to a fishing vessel and gear influence the decision of the individual fisher as to when to fish for surplus catch for sale.

- The demand for cash to fulfil other subsistence needs such as purchase of other consumer goods, payment of school fees, medical and social expenses also play an important role in a fisher's decision to fish.

- The extent of reliance on fishing further depends upon other opportunity incomes from wage labour, agriculture and the remittances from relatives residing elsewhere.

- Community activities, church obligations or attending to individual gardens usually take priority over the decision to fish for surplus catch.

- The weather, tides, wind and moon also play an important role in determining when to fish, where to fish and the method of fishing to use.

- More complicated factors such as whether a person belongs to the *gonedau* (traditional fishers) clan or not influence an individual's commitment to fishing as an occupation.

- The age of the individual is another factor, as older men very rarely go out fishing on boats.

The existence of the co-operative in Dromuna gives the village a sense of "communalism". It fulfils an important socio-economic function by facilitating the supply of ice, fuel and fishing gear. It also facilitates the marketing of catch. Thus without the co-operative, individual fishers would have to make their own provision for all these which means that it would be carried out at a much higher cost to the individual. Secondly, the existence of the co-operative also generally makes fishers obliged to sell to the co-operative because of the benefit they derive from the co-operative. This provides a sense of common practice as individuals in the village usually want to uphold the status quo.

In Vatani individual households have to make their own provision for ice, fuel and fishing equipment which means that they have to purchase these in advance if they want to fish. They also have to transport individual catches to the market. Villagers also rely on other sources of income such as wage employment outside the village, agriculture, coral harvesting and remittances. Individual households engage in whatever economic activity they prefer. There is no social obligation to any organisation or group like the co-operative in Dromuna. In other words, things generally are carried out on an individual basis. Fishing is a major source of income for only some households. The women are more active fishers collecting marine products like sea cucumbers and sea weeds. In Dromuna the men who belong to the co-operative are the dominant fishers.

In coastal rural villages like in Kaba Point where there are no direct access to the urban centres by roads, the co-operative plays an important role in facilitating the socio-economic livelihood of the people. On the other hand, the success of the co-operative as a business venture would depend upon the availability of adequate resource base (to ensure a continuous supply of fish) and how people perceive the role of the co-operative. From the analysis of the proposed project and discussions with the villagers, it may be concluded that the co-operative may eventually collapse if it embarks on a very ambitious plan which may not be financially and economically viable given the current limitations or factors under which it operates.

It is critical that the analysis of the proposed co-operative project is done under a given set of assumptions or circumstances. While estimation of the projected figures may not be totally accurate, it has been based on the information available and from the records, therefore it does reflect as accurately as possible the reality of the situation.

In brief, the analysis of the project has been carried out under the following assumptions:

- The project will involve all households in the village because if there is an ice plant, all villagers will have access to as much ice as they may require whenever needed. Thus with the availability of ice, fishers would be able to stay longer at sea and cover a wider fishing area than is possible at present. Consequently, production and operating cost are assumed to increase from the current level.

practices in the immediate fishing grounds).

- Since there is no provision to increase the vessel technology or any major re-structuring of fishing practices, it is assumed that cost would increase by one third (33 percent). This is because of increases in fuel cost for longer fishing trips.

- The average price of fish sold to the co-operative by fishermen has been taken from the co-operative records as $2.50 per kg. The average co-operative selling price to outsiders is assumed to be $3 per kg.

- If there is a capital grant of $74,000 by the government to purchase the ice plant, then the co-operative would have to bear an annual operating cost of $8,250.

- The income to break-even is projected at $0.50 per kg mark-up on fish sales; $0.14 per kg on ice and $0.10 per litre on fuel. Rental of equipment to other villagers and use of services by them and fisherwomen represent 56 percent of the income. This again may be optimistic and is used to calculate the break-even target level which may or may not be achievable.

- The discount factor used 12 percent which is the Fiji Development Bank's lending rate to the fishing industry. A 5 percent subsidy does not apply to this type of project (an ice plant), therefore is excluded.

The proposed project will not be viable even if we assume that production by all fishermen will double from the current level of operation. Other sensitivity analysis such as increase in sales by 20 percent and reduction in costs by 30 percent still does not make the project a viable venture. It is therefore important that alternative options must be considered.

RECOMMENDATIONS

The following are some of the possibilities which could be further explored through research and feasibility studies.

- A similar project but smaller in size and with lower investment requirement

- Feasibility of aquaculture development

- Improving the current infrastructure (shed and storage) with ice bought from Wainibokasi

- Improvement in management of the co-operative through better co-ordination and co-operation among members

- Explore the possibility of deep-sea fishery and expanding of fishing operations in

other areas of the customary fishing grounds.

- Improvement in fishing skills and technology in order to diversify fishing practices, thus minimising the use of gill nets.

- Identify potential for other sources of income such as agriculture, craftwork and eco-tourism to relieve fishing pressure on the coastal areas.

- Strengthen extension support to include community awareness programmes on coastal resource management.

FUTURE RESEARCH

It is important to do a more detailed study on the social organisation and social institutions, both formal and informal. This can provide useful insights into the community's commitment towards communal projects. It would be a useful exercise in the design of community-based fishery management systems not only for Kaba Point but other similar villages throughout Fiji.

General socio-economic information such as population, living conditions, ownership, use of resources, employment, income and so on must be more thoroughly documented in future studies to provide a useful base for analysing the dynamics of socio-economic change within the community.

I. A PRELIMINARY SOCIO-ECONOMIC STUDY OF KABA POINT

This following report is the result of a preliminary interview with eight women each in Dromuna and Vatani villages, personal observations and interview with the Cooperative Department officer in the village. The women who were chosen at random. Discussions were also carried out with the fishermen to allow an insight into the socio-economic situation in the village. Household interviews were conducted during the study to find out about the families living standards and the type of activities carried out by the family members. This information would provide a useful background for more detailed studies in the future.

Dromuna

General

Dromuna village consists of five *mataqalis* (clan) and nine *tokatoka* (extended families) and is part of Bau, Tailevu province and the Kubuna confederacy. The five *mataqalis* in the village are Nukulau (chiefly clan), Naitodua, Nasivou, Muaikaba, and Korolevu.

The village consists of 23 households with 10 concrete, 9 wooden, 2 bures and 2 corrugated iron houses. There is no direct source of fresh water supply. The villagers collect rainwater in drums and wash in a nearby pool. There are two community water tanks to supply drinking water. The supply of electricity was from the village generator and the supply was being facilitated during the time of study. The village has a new church and the old one is now being used as the community hall. There is one co-operative store where all villagers are shareholders.

There is a primary school and a community health centre in the village. The health centre is poorly equipped. Most of the villagers go to the hospital either in Nausori or Wainibokasi.

Dromuna is accessible by boat from the Nakelo Landing or from Mataidreketi. The cost for a return trip during the time of the study was around $40.00. Passenger fare is $10.00 return for people with cargoes and $4.00 return for those with no cargo.

There were five non-motorised punts in Dromuna and ten with outboard engines at the time of our study. The villagers can also hire punts from Ram Singh & Sons store at Nakelo if they wish to use these during their fishing. A punt is available for hire at $2.00 a day or $12.00 per week.

Population

The village population was around 91 with 100 people recorded as working and living away from the village (National Census,1994). During the study period, the village population was estimated at 95. The population structure is given in Table 1. (Provincial Council Census, 1994)

TABLE 1. Population of Dromuna

Age group	Male	Female	Total
0 -5 years	8	6	14
6-15 "	5	13	18
16-20 "	4	3	7
21-54 "	29	15	44
55+	3	5	8
Total	49	42	91

The lower numbers of villagers in the 16 - 20 age group indicates that most village children and young adults live elsewhere presumably attending schools or looking for paid employment. Further study is needed on the number of these people who return, and their ties with the village and its systems.

Agriculture and Land use

Most of the village land is hilly and covered with forest and patches of land under shifting cultivation. Plots for individual households are scattered in different places within the *mataqali* land. A plot is kept by a household for a number of years depending on soil fertility and crop type. Most villagers own breadfruit trees which have either been planted on their piece of allotted land or had grown on it naturally. Other crops include mangoes *(Manqifera indica)*, kavika *(Malay apple) (Syzygium malaccense)*, coconuts *(Cocos nucifera)*, avocado pears *(Persea americana)*, cassava *(Manihot esculenta)* , plantain *(Plantago major) (Musa balbisiana)*, yams *(Diocorea alata)*, bananas *Musa nana)*, dalo *(Colosia esculanta)*, bele *(Abelmoschus manihot*, sweet potatoes *(Ipomoea batatas)*, ivi *(Dioscorea alata)*, duruka *(Saccharum edule)*, and peppers *(Capsicum annum)*.

The subsistence fishers who do not own boats spent more time in their gardens than those who owned boats and nets. Agriculture provides a subsidiary source of income for the villagers. Occasionally coconuts *(Cocos nucifera)*, cassava *(Manihot esculenta)*, sweet potatoes *(Ipomoea batatas)* and plantains *(Plantago major)* are sold. Kavika *(Malay apple) (Syzygium malaccense)* and mangoes *(Manqifera indica)* are sold when in season. Even though there is limited arable land, there is the need to clearly assess the potential contribution of commercial agriculture to the village economy. The clearing of large areas of bushes can lead to massive soil erosion and possible land slides. Some households also owned chicken and pigs.

Tourism

Tourists visit Dromuna from the Toberua Island Resort. The visits are organised on Mondays every fortnight. The whole village participates in entertaining the tourists. People also sell handicrafts and shells. The funds received from these visits are used in

the village projects while proceeds from individual sale of items is kept by the households. The level of income derived from such activities should be measured against other sources of income to determine the level of reliance on the resort. About six villagers are employed at the Resort.

Village Fisheries

Seventeen out of twenty three households are registered as members of the Muaikaba Fishing Co-operative. From the Co-operative records only about 5 members have been regular fishers while the rest have been quite sporadic in supplying fish to the Co-operative. It was difficult to determine whether some fishermen by-passed the Co-operative and sold directly to middlemen or at the market or alternatively, because of low catch levels, did not have sufficient surplus catch to sell.

Men basically carry out fishing from boats using handlines, spear guns and gill nets. Gillnets were by far the most common fishing gear used. Nets are set or placed at high tide and retrieved at the next high tide. Women are also active fishers in the village, both in terms of supply of food for the household and in selling marine produce as a source of income. Women either glean at low tide or dive from punts. In many households, both husband and wife carry out their respective fishing operations together. A more detailed analysis of the fishing activities of both, men and women is needed in order to determine the level of effort and inputs into the fishery and the level of production or output. Such information can provide a better insight into the productivity of the fishers, and the potential for fisheries development.

Vatani Village

The study teams visit to Vatani village was short. Much of the information gathered was over lunch and through informal interviews with the women in the individual households.

General

Vatani village has a population of 192. An additional 219 people work and live outside the village. There are 28 households which consists of 14 concrete houses, 10 wooden, 12 corrugated iron and 3 *bures*.

Like in Dromuna, there is no source of fresh water supply except for a communal bath pool which the villagers claim is a natural spring. Drinking water is stored in drums and communal water tanks. The village has a radio-telephone service and a community hall. A new church was under construction during the time of visit. There are two individually owned stores in the village. Transportation problems and expenses in Vatani are identical to those mentioned by the people in Dromuna.

The children from Vatani attend the primary school in Dromuna. An inland bush track between the two villages is used by the villagers. The walk takes about 10 minutes.

Population

The village population structure is given below:

TABLE 2 Population of Vatani

Age Group	Male	Female	Total
0 -5	11	10	21
6-15	33	20	53
16-20	11	-	11
21-54	36	40	76
55 +	12	19	31
Total	103	89	192

The population features are similar to those of Dromuna where most of the teenage and young people from 16-20 live outside the village.

Agriculture and Land Use

In Vatani, the land area used for cultivation appeared to be larger than the area in Dromuna. In some areas flat and slightly hilly land was used more intensively. The variety of crops cultivated were similar to that in Dromuna. However, more land was cleared for taro and yaqona cultivation. From the household discussions, it was apparent that agriculture was an important source of subsidiary income for many households in Vatani.

Most women indicated that they usually took agricultural crops together with marine food to sell at the market.

Tourism

Tourists from the Toberua Island Resort visit Vatani on alternate Mondays. The village prepares tea and entertainment for the tourists and receives $100 per visit. The money goes to the community funds to upgrade village facilities. Individual households sell handicraft and shells to tourists when they walk around in the village.

Village Fisheries

The village fishermen initially belonged to the Naitodua Fishing Co-operative which was formed on 1963 with the Dromuna villagers. However, the Vatani villagers pulled out due to conflicts over the management of the co-operative. This co-operative eventually collapsed in 1989. The members from Vatani have formed a fishing group and have plans to set up their own co-operative. Details on how this fishing group operates and its

viability could not be obtained during the limited time of the study. In Vatani, women are quite active fishers in terms of providing food and income for the family. The main focus of the women and many household fishing operations is the collection of sea cucumbers and sea weeds. There is also some coral extraction and several younger village men are involved in this activity.

There were seven punts with outboard engines in Vatani. Men mostly carry out fishing with nets and handlines. The use of handlines by Vatani fishermen seems greater than the case for the Dromuna fishermen.

Women dive for seaweeds and sea cucumbers using goggles. Women are responsible for selling the catch at the market. They sell a variety of marine products including smoked fish, octopus, seaweeds, sea cucumbers, crabs, and prawns. The village also has two large fish fences which are checked at low tide mostly by women.

An Analysis of the Proposed Muaikaba Fishing Co-operative

The aim of this exercise was to look at the feasibility of the proposed co-operative project (Table 3). The analysis involved looking at the co-operative records on purchases, sales and financial statements. The co-operative officer from Nausori was also interviewed. Discussions were held with the manager and the treasurer of the co-operative as well as some of the members and other villagers.

History

In late 1992, a group consisting of members from Dromuna Village formed the Muaikaba Fishing Co-operative using their shares from the previous co-operative.

Present Status

There are seventeen (17) registered shareholders and the total funds as at the 14th of February 1995 was $7,900.73. This consisted of $3,143.35 as members funds, $2,704.80 as aid from the Forum Fisheries Agency (FFA), $1,522.53 as share capital and $530.05 as General Reserve. Savings in the bank for the same period was $3,869.50.

The Co-operative does not have an office building. Catch is recorded in a storage shack located near the seawall. Inside the shack, there is a weighing scale and two old freezers which hold ice bought from Nausori. The catch is kept on ice in these freezers until Saturday morning or until enough catch has been accumulated to justify a trip to the market. The treasurer weighs the catch brought by the fishermen and pays them according to weight and species.

The Muaikaba Co-operative had submitted a proposal for a capital grant to the Poverty Alleviation Fund. This was not successful because the project was considered to be outside of the scope of the Fund and the village did not provide evidence of poverty. However, the village is still keen to pursue the project. Discussions with village elders indicated that they perceived this as the most important form of assistance to improve

the income levels of the villagers. The proposal is the same as when it was submitted to the Poverty Alleviation Fund. A preliminary financial and economic analysis of the project has been carried out to determine the feasibility of the project.

Analysis of the Proposed Project

The project will involve the whole village which consists of 23 households. With the project, fishermen will be able to stay longer at sea and cover wider fishing grounds. Ice would be readily available and fishermen can sell their catch to the co-operative when ever they want.

It is assumed that production would double from the current level while operating costs would increase by one third because more fuel would be required. The average price of fish paid to fisherman is about $2.50 per kg based on the current average domestic wholesale market price for fresh reef fish. The average level of catch is projected as 574 kg per fisherman per year which has been estimated from 1993 and 1994 production levels. From the estimates, the gross annual income per fisherman is calculated to be $1,435. Average total cost is around $663.00 which gives an average net income of $772. Details on production, cost and revenue calculations are given in APPENDIX II.

The opportunity cost for the subsistence fisherman would be $301. For a member of the cooperative operating a motorised punt, and using gill nets, the opportunity cost would be $137. This represents the costs that an individual fisherman has to forego in order to become part of this new project. This would give $471.00 as net benefit to a subsistence fisherman and $635 as net benefit to a current co-operative member as they would both derive an average annual income of $772 by implementation of the project. These incremental costs and revenue details are given in Table 4. Loss of benefits derived from other subsistence activities such as agriculture could not be determined due to time constraints but these were considered marginal in terms of having any major impact. All fishermen ensure that the family receives adequate supply of fish as a practice and this would continue even if they join the co-operative.

If the $74,000 capital cost is financed by the government as a straight grant, the co-operative members would be able to operate and manage the terminal with an annual operating cost of $8,250. This would increase the cost per fisherman by $358.70 which would in turn reduce the real net benefit to $276.30 for co-operative net fisherman and $112.30 to subsistence fisherman. However, if the terminal is able to break-even with income derived from use of its services and facilities by others and with a mark-up of 10 percent on fuel, $0.14 per kg on ice sales, and a $0.50 per kg on fish sales through the co-operative, then the net benefit for all fishermen would be higher. It would be closer to $471 for subsistence and $635 for co-operative net fishermen. Details on terminal operating costs are given in Table 5.

Other indirect benefits from the project would be the use of cold storage for storing other perishable goods by the villagers. With the project, other village members can also participate in fishing as the market would be readily available. With ice being readily available, fishermen can extend their fishing areas and relieve fishing pressure in over-exploited areas closer to their villages. If a viable co-operative exists and villagers are able to derive a means of support, the urban drift would not be a problem as school

drop-outs and others can participate in the fishing activities. The major indirect cost would be spending longer periods of time at sea fishing. Thus villagers would have less time to attend to their gardens and other communal and social activities. This may also have an impact on the division of labour within the household. Those household members not involved in fishing may attend to the gardens so that the net economic loss from subsistence agriculture would be marginal.

The proposed project is not economically viable even if production doubles and costs increase by only one third from the current level given that fishermen's investment into boat and gear remain the same. This is because the NPV (Net present value) is negative. This is calculated in Table 6. The financial benefits over costs is equal to 0.68 which means that the project under the given circumstances is not viable as the costs outweigh the benefits. For the co-operative to be successful, it is necessary that it becomes financially viable. Details of financial analysis is given in Tables 3 - 6. It is assumed that the terminal with all its assets would have a useful life of eight years. This is based on the experience of similar co-operative projects (Turaganivalu, pers.comm).

Considering the performance of fishermen from the co-operative (as indicated in part C) and given the socio-cultural situation in the village, the desire to increase income levels and to keep traditional social and cultural practices, need careful planning in order to achieve a balance or an acceptable level of compromise. The planning authority and the people of Kaba need a clear vision on the type of development they desire that would improve their welfare and long term sustainability.

The following is a preliminary analysis of the feasibility of the proposed Muaikaba Fisheries Terminal Project:

TABLE 3

Proposed Muaikaba Fishing Co-operative Capital Cost

	$
Storage Building	16387.01
Combination freezer/coolroom	33000
Generator - 15KVA 3 Phase	11000
Fibre glass boat/engine	7133.5
Salter scale (2)	1514.6
Capital funds requested	69035.11
Working Capital	5000
Total Funds requested	**$74,035.11**

TABLE 4.

Muaikaba Fishing Co-operative Project
Production (catch), Average Income, Operating Cost and Incremental Income

Fishery Type	Average annual catch (kg)*	Average gross annual income* (price = $2.50)	Average operating cost ($)*	Average annual net income ($)	No. of fishermen (with Project)	No.of fishermen (without Project)	Total incremental net income ($)
Type A: fishermen with motorised punts, use of nets, lines, spear guns (co-op members)	382	955	818	137	0	17	2329
Type B: Semi-subsistence, irregular use of punts	192	480	179	301	0	6	1806
Type C: similar to Type A but Type A: with more deep-sea line fishery, extended fishing grounds some use of nets	574	1435	663	772	23	0	17756
					23	0	13621

* Details in APPENDIX II

Site 3 (slope)

Replicate 1: Depth = 3.66 m, Diameter = 14.2 m, Time = 7.14 min, Tide = high, Visibility = 7 m,

Area = 70.09 m^2

Replicate 2: Depth = 3.66 m, Diameter = 15.5 m, Time = 7.17 min, Tide = high, Visibility = 8 m,

Area = 76.51 m^2

Replicate 3: Depth = 4.57 m, Diameter = 15.7 m, Time = 7.24 min, Tide = high, Visibility =10 m,

Area = 77.50 m^2

Replicate 4: Depth = 4.57 m, Diameter = 15.2 m, Time = 7.02 min, Tide = high, Visibility = 10 m,

Area = 75.03 m^2

Replicate 5: Depth = 6.40 m, Diameter = 15.3 m, Time = 7.07 min, Tide = high, Visibility = 8 m,

Area = 75.52 m^2

Replicate 6: Depth = 3.10 m, Diameter = 14.3 m, Time = 7.00 minutes, Tide = high, Visibility =10 m,

Area = 70.59 m^2

TABLE 18. Site 3 substrate transects (percent cover).

	1	*2*	*3*	*4*	*5*	*6*
Rubble	24.6	43.9	58.0	64.5	49.7	39.9
Hard Coral	62.7	47.1	38.8	35.5	49.0	47.5
Sand	12.7	9.0	3.2	0	0	12.6
Soft Coral	0	0	0	0	1.3	0

TABLE 19. Site 3 fish census results by family (in order of overall abundance).

	1	*2*	*3*	*4*	*5*	*6*	*Total*
Lutjanidae	1	0	20	0	12	0	**33**
Scaridae	9	11	6	12	11	15	**64**
Acanthuridae	2	4	8	4	8	0	**26**
Labridae	0	2	1	1	2	0	**6**
Chaetodontidae	3	2	0	4	0	0	**9**
Lethrinidae	0	0	1	0	3	3	**7**
Holocentridae	0	0	0	0	3	3	**3**
Mullidae	0	1	2	3	3	1	**10**
Serranidae	3	2	4	3	1	1	**14**
Siganidae	0	0	0	2	0	0	**2**
Haemulidae	0	0	0	0	1	0	**1**
Balistidae	0	0	0	0	0	0	**0**
TOTAL	**18**	**23**	**42**	**30**	**44**	**20**	**77**

TABLE 20. Species recorded at Site 3.

	1	*2*	*3*	*4*	*5*	*6*	*Total*
Acanthuridae (surgeonfish)							
Acanthurus dussumieri			4	1	4		9
A. nigricauda		1	1	3	2		7
Ctenochaetus striatus	2	1	2				5
Zebrasoma scopas		2	1		2		5
TOTAL							26
Balistidae (triggerfish)							
Sufflamen bursa		1		1			2
TOTAL							2
Chaetodontidae (butterflyfish)	3	2		4			9
TOTAL							9
Haemulidae (sweetlips)							
Plectorhynchus chaetodonoides					1		1
TOTAL							1
Holocentridae (squirrelfish)							
Neoniphon sammara					3		3
TOTAL							3
Labridae (wrasses)							
Cheilinus trilobatus		2		1	1	2	6
TOTAL							6
Lethrinidae (emperors)							
Lethrinus harak						3	3
Monotaxis grandoculus			1		3		4
TOTAL							7
Lutjanidae (snappers)							
Lutjanus fulviflamma			15		12		27
L. fulvus	1		4				5
Macolor niger			1				1
TOTAL							33
Mullidae (goatfish)							
Parupeneus barberinus		1	2	3	3	1	10
TOTAL							10
Scaridae (parrotfish)							
Scarus altipinnis			1	1	1		3
S. ghobban		1	1				2
S. spp.	9	10	4	11	10	15	59
TOTAL							64
Serranidae (groupers)							
Epinephelus caerulopunctatus		1	1				2
E. hexagonatus	1	1	1	3		1	7
E. polyphekadion	1						1
Plectropomus leopardus					1		1
P. maculatus	1		2				3
TOTAL							14
Siganidae (rabbitfish)							
Siganus punctatus				2			2
TOTAL							2

Replicate 1: Depth = 9.15 m, Diameter = 15.9 m, Time = 7.12 min, Tide = high, Visibility = 12 m,

Area = 78.48 m^2

Replicate 2: Depth = 9.15 m, Diameter = 14.4 m, Time = 7.01 min, Tide = high, Visibility = 8 m,

Area = 76.51 m^2

Replicate 3: Depth = 7.62 m, Diameter = 15.3 m, Time = 7.03 min, Tide = high, Visibility = 13 m,

Area = 75.52 m^2

Replicate 4: Depth = 7.62 m, Diameter = 15.0 m, Time = 7.02 min, Tide = high, Visibility = 14 m,

Area = 74.04 m^2

Replicate 5: Depth = 4.00 m, Diameter = 14.8 m, Time = 7.21 min, Tide = high, Visibility = 8 m,

Area = 73.05 m^2

Replicate 6: Depth = 4.00 m, Diameter = 14.6 m, Time = 7.05 minutes, Tide = high, Visibility = 10 m,

Area = 72.07 m^2

TABLE 21. Site 4 substrate transects (percent cover).

	1	*2*	*3*	*4*	*5*	*6*
Rubble	74.8	17.4	56.7	0	27.7	74.6
Hard Coral	25.2	82.6	43.8	100	69.6	24.0
Sand	0	0	0	0	0	0
Soft Coral	0	0	0	0	2.7	1.4

TABLE 22. Site 4 fish census results by family (in order of overall abundance).

	1	*2*	*3*	*4*	*5*	*6*	*Total*
Lutjanidae	0	0	0	69	0	0	**69**
Scaridae	7	6	17	3	67	10	**110**
Acanthuridae	4	12	11	0	2	2	**31**
Labridae	6	4	5	3	4	3	**26**
Chaetodontidae	3	0	1	0	2	2	**8**
Lethrinidae	0	0	0	15	0	0	**15**
Holocentridae	0	0	0	33	0	0	**33**
Mullidae	0	0	3	0	0	2	**5**
Serranidae	2	0	1	0	2	3	**8**
Siganidae	2	2	6	1	2	0	**13**
Haemulidae	0	0	0	4	0	0	**4**
Balistidae	0	0	0	0	0	0	**0**
TOTAL	**24**	**24**	**44**	**128**	**80**	**22**	**322**

TABLE 23. Species recorded at Site 4.

	1	*2*	*3*	*4*	*5*	*6*	*Total*
Acanthuridae (surgeonfish)							
Acanthurus nigricauda	3	1	3			1	8
Ctenochaetus striatus		8	8				16
Zebrasoma scopas	1	3			2	1	7
TOTAL							31
Chaetodontidae (butterflyfish)	3		1		2	2	8
TOTAL							8
Haemulidae (sweetlips)							
Plectorhynchus chaetodonoides				4			4
TOTAL							4
Holocentridae (squirrelfish)							
Neoniphon sammara				33			33
TOTAL							33
Labridae (wrasses)							
Cheilinus fasciatus	2	2	3	2	2		11
C. trilobatus	3	2	1			1	7
Hemigymnus fasciatus	1		1	1	3	2	8
TOTAL							26
Lethrinidae (emperors)							
Monotaxis grandoculus				15			15
TOTAL							15
Lutjanidae (snappers)							
Lutjanus fulvus				46			46
L. kasmira				21			21
L. russelli				2			2
TOTAL							69
Mullidae (goatfish)							
Parupeneus barberinus			3			2	5
TOTAL							5
Scaridae (parrotfish)							
Cetoscarus bicolor				1			1
Hipposcarus longiceps		1			2	1	4
Scarus altipinnis			1				1
S. ghobban	1	1	1		9	1	13
S. niger		1	1				2
S. spp.	6	3	14	2	56	8	89
TOTAL							110
Serranidae (groupers)							
Epinephelus hexagonatus						1	1
Plectropomus maculatus	2	1	1		2	2	8
TOTAL							9
Siganidae (rabbitfish)							
Siganus punctatus	2	2	6	1	2		13
TOTAL							13
Other							
Holothuria variegatus	1						1

Line Intercept Transects

Divers performed a total of seven 10-m transects at 5 m depth and one at 3 m. Results are summarised in Table 24. See Table 7 for explanation of abbreviations used for the lifeform categories.

TABLE 24. Substrate/coral transect data (percent cover).

	Site *							
	1	***2***	***3***	***4***	***5***	***6***	***7***	***8*** **
S/R	69	45	65	27	6	46	16	21
T	15	5	5	0	15	2	11	12
SG	0	0	0	0	30	0	0	0
HCM	5	4	1	65	0	6	11	13
HCB	0	0	1	0	0	24	0	32
HCF	0	0	0	0	0	6	0	11
SC	0	0	4	0	5	0	0	0
SCB	2	16	3	8	0	0	59	0
SPO	4	30	11	0	0	2	3	3
OFA	0	0	8	0	0	0	0	0
HAL	2	0	2	0	44	0	0	0
GC	0	0	0	0	0	0	0	8
MUSH	0	0	0	0	0	14	0	0

* Data for sites 1 through 5 were extracted from a single 50-m transect, while sites 6, 7, and 8 represent separate 10-m transects.

** Transect site 8 was performed at 3 m depth.

The general impressions recorded for each site are as follows:

1-5: Gentle slope, mostly sandy bottom with scattered coral heads. Most fish seen were Pomacentrids (damselfish) 2-6 cm. Few larger fish seen, however, the visibility was poor. Strong surge up and down slope. Generally bleak looking landscape.

6: Many vibrantly coloured (red and orange) branching corals. The delicate unbroken branches provided shelter for numerous fish including 3 Haemulids, numerous Lethrinids and Lutjanids. Sandy bottom between coral outcrops. This site was the healthiest looking area of all surveyed. However, no sea cucumbers or giant clams were seen.

7: Numerous small patches of corals, sandy bottom, many Pomacentridae (damselfish). Many mushroom corals but no sea cucumbers.

8: Area was very shallow (less than 1 m in places) with sandy bottom interspersed with seagrass patches. The survey site (3 m depth) was also sandy, but consisted of several large outcrops of coral and rock supporting encrusting organisms, especially giant clams (*Tridacna derasa*) Few fish and no sea cucumbers were seen.

Data from the Line Intersect Transect (Table 24) show that half of the sites were dominated by sand and rubble (Sites 1, 2, 3, and 6). Sites 4 and 8 had the highest percent of hard coral cover with 65 percent and 56 percent, respectively. Moderate turf cover was identified at all of the sites, with the exception of Site 4 which was dominated by hard corals. Site 5 was dominated by *Halimeda* (a lightly calcified green alga that is rarely eaten by herbivorous fish because it produces strong chemical deterrents), with extensive seagrass (30 percent) and turf (15 percent). Site 7 was the only site with a predominance of soft corals. They constituted 59 percent of the cover while at the other 7 sites, soft coral was measured from 0 percent to 16 percent.

Other substrate data

General transects of substrate composition were also performed for the four sites where fish censusing was done. Four types of substrate were identified: sand, rubble, hard coral, and soft coral. The transect data from these sites (Tables 12, 15, and 20) reveal that the substrate type is predominantly sand and rubble. A summary of the results follows:

Site 1: sand and rubble were identified as the most common substrate (82.9 percent) for all of the six replicates, exceeding all of the other sites; the range was from 62.1 percent to 94.7 percent. Hard coral ranged from 5.3-37.9 percent with an average of 17 percent for the six replicates. There was no soft coral in any of the replicate transects for Site 1.

Site 2: sand and rubble covered an average of 55.1 percent, ranging from 30.1 to 81.5 percent. Mean percent hard coral was reported at 43.2 percent (ranging from 11.6 to 69.9 percent). The soft coral was found in abundance at four of the six replicates (ranging from 1.3-4.4 percent).

Site 3: one replicate transect had soft coral (1.3 percent). 53 percent was sand and rubble category (range was 37.3 percent - 64.5 percent). The remaining 46.8 percent constituted hard coral and ranged from 38.3 percent to 62.7 percent.

Site 4: this site exhibited the largest disparity among replicates of all of the sites. For example, replicate 4 of Site 4 had no rubble and 100 percent hard coral, while replicate 6 had only 24 percent hard coral, 74.6 percent constituted rubble and 1.4 percent constituted soft coral.

Intertidal flats and mangrove area

The intertidal mudflats and mangrove area surrounding Kaba Point is rocky and covered with course mud and sand. The team observed ark shells (*Anadara spp., kaikoso*) and

oysters (*Spondylus squamosus*, *kolakola*); three sea cucumbers (1 *Holothuria scabra*, *dairo*; 1 *H. atra*, *lololi*; and 1 *Stichopus variegatus*); and a few small urchins (1 *Toxopneustes sp.* and several small *Tripneustes gratilla*, *cawake*). In several sites, especially in the shade of the mangroves, there were piles of empty shells left by the women, who discard the shells once cleaned of their meat. These were composed primarily of: *Spondylus squamosus* (ducal thorny oyster, *kolakola*), *Periglypta puerpera* (youthful venus, *kaidawa*), *Fragum unedo* (unedo cockle, *kaivada*), and *Atrina spp.* (pen shell). Other shells collected in the area include *Turbo cinerea* (smooth moon turban, *lasawa*), *Nerita albicilla* (ox-palate nerite, *madrali*), *Polinices sp.* (moonsnail, *drevula*), and *Gafrarium tumidum* (*kaitakadiri*, *qeqe*). There were numerous brittle stars and small crabs (1-2 cm across).

Most noticeable at the sites visited was the scarcity of organisms usually found in such areas, sea cucumbers in particular.

DISCUSSION

This study is a pilot survey of the marine resources near Kaba Point. It is offered as a very basic, preliminary assessment that can be read as a snapshot view of a small section of the Kubuna waters. General descriptions and impressions are included to supplement the results from the surveys. This survey will be of most benefit to those who continue the analysis of the resources through follow-up surveys. It can be used as a baseline from which to compare results of future studies. However, it should be interpreted carefully as the surveys were completed in a very limited time (3-days), the quantitative data (transects and fish counts) represent an area which is only a small percentage of the entire Kubuna Customary Fishing Rights Area, and effects, such as those of seasonal variations, do not appear.

Fish counts

The majority of the fish recorded during the Underwater Visual Census are relatively small individuals of the smaller, less commercially valuable species. The fish families in order of abundance at all four sites are listed in Table 25. Table 26 shows the 10 most commonly seen fish species.

There is evidence of anthropogenic stress on some of the fish stocks. There was a preponderance of small species, especially snappers, seen during the fish counts. Very few of the large, commercially important fish (i.e., emperors, rock cod, jacks) were recorded. In addition, the species that were most commonly caught in local nets (rabbitfish, mullets, and goatfish) were poorly represented in the fish count data. Villagers spoke of days when one net would yield a boatload of mullets, yet nets brought in during our stay held only several dozen Lethrinids (< 30 cm), a few snappers (*sabutu*) and one trevally (*saqa*), a shovel nosed ray, and a hammerhead shark.

The reported size distribution of censused species (APPENDIX 1) also indicates that many of the food fish have been overharvested. For example, the average reported size of Scarids (parrotfish) was around 17 cm, but they grow two, three and four times this size if allowed to reach sexual maturity. This suggests that the larger, mature fish are

selectively removed from the population (fished), perhaps before they have an opportunity to spawn and replenish their stocks. It is indicative of recruitment overfishing in the area. This is not limited to the Scarids; it applies equally to the other species.

The smaller fish were more frequently counted in four families: Acanthuridae (surgeonfish), Lutjanidae (snappers), Mullidae (goatfish), and Scaridae (parrotfish). If upper size limits of fish families are considered in addition to the data obtained here, the Lethrinids (emperors) which can grow as large as 30 cm, Serranids (groupers) which are generally 50 cm or more, and Siganids (rabbitfish) which grow up to 30 cm, are all in the same predicament. A dominance of smaller sized individuals in a population has been associated with overfishing of stocks (Russ, 1991).

Some areas surveyed had relatively large groups of fish. For instance, 400 snappers were counted at Site 1, most of these were found in schools in two of the replicates. Over 100 juvenile parrotfish and a school of more than 30 squirrelfish were counted at Site 4. This may appear to be good news, but snappers have been known to school in the thousands and some species of mature Scarids forage in groups exceeding several hundred individuals (Ballou, pers. obs.).

Comparative data must be treated carefully, as each localised area is in fact very different in terms of available niches, influx of organisms and nutrients, water salinity, substrate/bottom composition, reef habitat quality and character. However, a similar survey conducted in the Verata waters, just to the north of Kaba's fishing rights area, is useful because of the proximity of the study sites. This survey reported a predominance of emperors, butterflyfish, mullet, goatfish, rabbitfish and squirrelfish in order of abundance (Batibasaga *et al.* 1995). This report interestingly concluded that those waters were overfished because of the low density of carnivorous species (i.e., sweetlips, coral trout and rock cod). However, in comparison with the results from the UVC-fish census from Kaba Point, the Verata waters sound very rich in the important commercial species, particularly those which are usually caught in nets.

The Verata report indicates that Serranidae (groupers) are a valuable species to fisherfolk and can be used as an indicator of fishing pressure. Mullidae (goatfish), Lutjanidae (snappers), and Siganidae (rabbitfish) are the species singled out by gill nets and their relative abundance can be used as an indicator of the pressures of gill netting specifically. Aside from snappers, few of the other indicator species were recorded during the Kaba Point fish census. Lastly, the Verata report points out that Chaetodontids (butterflyfish) are both colourful and conspicuous reef species and could be used as an index of abundance and species richness of both reef fish and corals.

The Verata survey was designed to assess the possibility of setting up giant clam farms to supplement the local diet and income and to restock this once abundant organism in the area. The focus was on sedentary organisms such as giant clams, sea cucumbers, urchins, seaweed, shellfish, and corals, rather than fish. Because commercial gill netting has been recently banned from the Verata waters, it would be interesting to have more detailed baseline data for the fish species there as well.[3] It would help to both evaluate

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3. Quantitative data was not included in the report.

the effect of the ban and would also provide comparative data for regional surveys and studies.

TABLE 25. Fish families in order of overall abundance.

Lutjanidae	snappers
Scaridae	parrotfish
Acanthuridae	surgeonfish
Labridae	wrasses
Chaetodontidae	butterflyfish
Lethrinidae	emperors
Holocentridae	squirrelfish
Mullidae	goatfish
Serranidae	groupers
Siganidae	rabbitfish
Haemulidae	sweetlips
Balistidae	triggerfish

TABLE 26. Most commonly seen fish species.

Species	*Number observed*
Lutjanus kasmira	294
Scarus spp.	235
L. gibbus	118
L. fulvus	71
Ctenochaetus striatus	45
Acanthurus dussumieri	43
Chaetodontidae	43
S. ghobban	42
Neoniphon sammara	37
L. fulviflamma	27

Coral cover

The areas observed during the Line Intersect Transects generally consist of sand and rubble with scattered patches of hard and soft corals. There are extensive patches of seagrass beds as well as large areas with *Halimeda* and other small seaweed species. There was a noticeable absence of resources such as sea cucumber (harvested for bêche-de-mer), giant clams, and fish. One would expect in areas of shallow mud flats and sandy bottom with rubble and extensive filamentous turf that there would be an abundance of these resources and that the waters would be full with parrotfish, goatfish, rabbitfish, and other algal feeding species. This was not the case; the fish that were seen during the LIT were mostly small damselfish.

Hard and soft corals make up only a small percentage of the benthic community at the sites surveyed (see Table 13). Coral harvesting in these areas could be devastating if continued or increased to a more massive scale, when it would result in severe loss of coral reef habitats. Coral reefs, once damaged by removal or destruction of coral, the onset of bacterial and fungal infection in damaged specimens, or otherwise, can take more than 30 years to fully recover (Alcala and Gomez 1987).

Habitat destruction may be even more damaging to fish stocks than overfishing because changes in the structure or health of corals can affect the species living on or near the corals (Rubec 1988). For instance, long-term, large scale destruction or removal of live coral will result in the coral being replaced by benthic turfing algae (Moran 1986). This does not usually result in an increase in herbivorous fishes that graze on the alga. Tropical reef fish species depend heavily on shallow backreef habitats for larval settlement and recruitment; loss of this habitat jeopardises the viability of future stocks. Finally, another important consideration is that ciguatera poisoning outbreaks have been linked to events that result in the breakage of corals (Bagnis *et al.* 1988).

Reef flat

The reef flat was relatively barren. Women had to walk to areas far from the villages to glean. In fact, women from Vatani travelled by punt to reach areas with sufficient supplies of sea grapes. The women in Dromuna had no access to such transport. Shells were available but, at first glance, not extremely abundant. However, more comprehensive reef flat surveys should be done to assess the state of the invertebrates in these areas.

It is very important to note again that during both the fish counts and the coral transects, very few sea cucumbers and giant clams were seen. In a habitat such as the one described here, these organisms are usually abundant. Other areas in Fiji, as elsewhere in the Pacific, have suffered a similar decline in these species due to heavy collecting. In fact, one species of free-standing giant clam, *Hippopus hippopus*, is extinct in Fiji (Munro 1993) and sea cucumbers collected for processing into bêche-de-mer have shown signs of decline (Stewart 1993).

CONCLUSION

While the data presented and the analysis offered make it tempting to jump to conclusions about overfishing in the area, one must consider the many factors which are known to influence the abundance of marine species. They include, among other things:

- natural changes in spawning, settlement, and recruitment patterns of larval and juvenile species of fish, clams, sea cucumbers, corals.

- weather (i.e., increased freshwater runoff, increased siltation, cyclone damage)

- human induced changes in the marine environment as a result of:
  - reduced coral cover because of collection of corals for overseas export or for local construction and ornamental uses
  - change in population structure due to exploitative fishing practices
  - unmonitored and uncontrolled fishing practices that lead to overfishing of areas (especially the use of destructive and/or non-selective gear)
  - excess of licenses issued to commercial fishing operations
  - pollution
  - nearshore erosion/runoff due to agriculture and development

In addition, several factors could affect the accuracy of results of the Underwater Visual Census, including weather, tide, lunar cycles, time of day, biological cycles, sensitivity of fish to disturbance by divers, boat traffic, and visibility. For instance, different species and different numbers of fish could have been observed if the census had been taken during the evening or at another time of the year. The influence of these factors are compounded by the imprecise nature of fish censusing procedures. They are neither absolute nor accurate measurements of abundance; however, the more often they are done, the more representative the data become (Sale and Douglas 1981).

Despite these difficulties, this study has uncovered several important aspects about the marine resources near Kaba Point:

- predominance of small-sized fish species

- higher number of small-sized fish

- few fish species that are generally caught in nets

- no sea cucumbers or giant clams in any significant amount

- small patchy outcrops of corals supporting few fish

RECOMMENDATION

It appears that Dromuna and Vatani villages are feeling the pressures of declining marine resources. By diversifying both their methods of fishing and their means of obtaining cash income, the villagers can take some pressures from the reef's resources. Alternate sources of cash and food can help, as can practices that help to regenerate and sustain the marine resources in the area. The combination of habitat loss through extensive coral collecting and overfishing can be irreversibly damaging to the future of Kaba's reefs and fisheries. Some steps to improve the state of Kaba's resources are:

- ban all gill netting for a period
- delineate more areas as closed to fishing and collecting to allow stock regeneration
- giant clam reseeding project[4]
- seaweed farming trials, one species that could be tried is *nama*, *Caulerpa spp.*
- increase women's involvement in fisheries cooperative to broaden the resource base that is exploited. This must be carefully monitored so as to avoid continued overfishing.
- develop land-based resources (gardens and plantations, pigs, chickens, etc.) as alternative to processed foods and as an additional source of income
- initiate nutritional training programmes that encourage wider use of locally grown or collected foods, to decrease the reliance on store-bought items
- encourage villagers not to collect every last piece, but to leave some behind for next time (i.e., cut some of the sea cucumbers *Stichopus variegatus* in half and leave them to regenerate, and carefully break sea grapes at the stolons, leaving the stalks to grow back)
- monitor and manage coral harvesting operations

4. The arca is presently being considered for this development scheme offered through the Fisheries Division.

FUTURE RESEARCH

Follow-up surveys can be improved by more intensive sampling during both fish counts and coral cover transects. Other studies that could prove useful are:

- creel studies of both local and commercial fishers
- transects of the reef flats to determine the abundance of shells, sea cucumbers, urchins, seaweeds, etc.
- assessment of coral harvesting activities in the area.

Subsequent studies should be very mindful to obtain data that can be directly compared to the data presented in this baseline marine resource assessment survey. This requires that research/survey teams visit the same or similar sites when conditions are comparable (i.e., the tide levels, direction of the tide, time of day, and phase of the moon). Methods should be replicated and procedures followed as closely as possible. This will ensure that subsequent results can be manipulated, organised, and compared directly with the data and results presented in this report. More sites, especially at the main reef, should be assessed as possible additional fishing grounds. The reef flats should be more thoroughly surveyed to establish a more substantial baseline database. Expanding the database for fish and sedentary species, and including specific information on seaweeds, giant clam populations, and extent of coral harvesting, is strongly recommended. The success and usefulness of this survey rests on its practical use and application to subsequent marine resource assessment surveys.

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APPENDIX I.

Observation report on the level of effort and catch during the study period in Dromuna Village

Five individual fishermen's fishing trips were recorded. This also represented the total catch by the co-operative fishermen during the two days. All had used gill nets that were set from punts inside the barrier reef. Details of their catch and effort is given below. It must be noted that because of the presence of the research team in the village, this may not truly reflect the normal level of operation. This observation nevertheless reflects the level of productivity from the immediate fishing grounds frequently used by the village fishermen.

Wednesday

Fisherman I.

Net size :	350 yds
Mesh size:	3 ins.
Set net :	6.00 pm (Tuesday)
Haul net :	6.00 am (Wednesday)
Total catch:	2.5 kg
Species:	Ki - 0.5 kg, Matalau - 2.00 kg

Fisherman II.

Net size:	200 mt	Mesh size:	3 ins.
	100 mt		5 ins.
	50 mt		6 ins.
	30 mt		6 ins.
Set net:	5.30 pm (Tuesday)		
Haul net:	7.00 pm (Wednesday)		
Total catch:	17.4 kg		
Species:	Tanabe - 1.5 kg, Cebe - 0.5 kg, Sabutu - 1.5 kg, Bo - 0.5 kg, Ivilakalaka- 1.9 kg, Cucu - 1.8 kg, Cumu - 2.3 kg, Salala - 1.9 kg, Kaikai - 1kg, Vai - 4.5 kg		

Fisherman III.

Net size:	240 yds	Mesh size :	4 ins.
	100 yds		3 ins.
Set net:	6.00 pm (Tuesday)		
Haul net:	6.00 am (Wednesday)		
Total catch:	6 kg		
Species:	Nuqa - 1.5 kg, Tanabe - 2 kg, Yaga (shells) - 2.5 kg		

Thursday

Fisherman I.

Net size :	350 yds
Mesh size:	3 ins.
Set net:	6.00 pm (Wednesday)
Haul net:	6.00 am (Thursday)
Total catch:	0.6 kg.
Species :	Kanace - 0.5 kg, Tivitivi - 0.1 kg

Fisherman II.

Net sizes :	4 x 350 yds/ each
Mesh size:	2.75 ins.
Set net:	6.00 pm (Wednesday)
Haul net:	6.00 am (Thursday)
Total catch :	6 kg
Species:	Kanace - 1 kg, Cucu - 0.2 kg, Kabatia - 0.8 kg, Saku - 1 kg, Nuqa 2kg, Kawaqo - 1 kg.

Fisherman III.

Net size:	350 yds
Mesh size:	3 ins.
Set net :	6.00 pm (Wednesday)
Haul net:	6.00 am (Thursday)
Total catch:	4 kg
Species:	Tugadra - 0.2 kg, Kawaqo - 2 kg, Bo - 0.3 kg, Matalau - 1 kg, Salala - 0.2 kg, Sabutu - 0.3 kg.

Fisherman IV.

Four nets used.

Net size:	200 mt	Mesh size :	3 ins.
	100 mt		5 ins.
	50 mt		6 ins.
	30 mt		6 ins.
Set net:	6.30 pm (Wednesday)		
Haul net:	6.30 am (Thursday)		
Total catch:	23.1 kg		
Species:	Sabutu - 2.8 kg, Kabatia - 2.8 kg, Matalau - 1.8 kg, Salala - 0.8 kg, Saqa - 2 kg, Tanabe - 1 kg, Ivilakalaka - 1.8 kg, Cucu - 0.6 kg, Qiouluvai - 9.5 kg.		

Fisherman V.

Two nets used.

Net size:	100 yds	Mesh size :	3 ins.
	240 yds		4 ins.
Set net:	6.00 pm (Wednesday)		
Haul net:	7.00 am (Thursday)		
Total catch:	6.5 kg		
Species:	Kawaqo - 2.5 kg, Vai - 2.5 kg, Qiouluvai - 1.5 kg.		

APPENDIX II

Fisherman's Costs and Production Estimate Details

Prices are based on the 1993 prices.

Fisherman's costs

TYPE A: (A co-operative member who owns a motorised punt and uses nets, lines and spear-guns)

Major operating costs faced by fishermen:

i) Gear costs - Majority of the village fishermen use gill nets. Net size varies in the village but the most widely used size is a four coil net. This is taken as the average size of net used in the village.
Average cost of a 4 coil net = $480:- $320 for floats, ropes, twine or line and $160 for mesh coil.

It is assumed that net repairs take place annually with the replacement of mesh coil only. Most fishermen interviewed owned more than one net. It was however not possible to determine the total number of nets in the village. It is assumed that an individual fisherman owns two nets, the annual repairs of two nets would cost him ($160 x 2) = $320. This is the replacement of mesh coil.

ii) Fuel costs - Fishermen do not keep any records of their expenses. Using 1993 audited accounts of the co-operative (3/9/93 -30/6/94), fuel cost was $5607.15. The calculated fuel cost for 12 months was ($6,728).

Annual fuel cost estimate for 1993 = 5607/10 x 12 = $6,728

Taking into account that the co-operative consists of 17 members
$6,728/17 = $396
Thus current level of average fuel cost was an estimated $396 per member of the co-operative.

iii) Ice - Fishermen use ice on an irregular basis. Since fishermen do not keep a record of ice used, the co-operative financial statement was used to determine the individual cost for ice. Using 1993 accounts, the ice cost was worked out at = 898/10 x 12 = $1,077.60 (annual ice cost)

Thus average ice cost per co-operative fisherman was estimated to be $1,077/17 = $63 per year.

iv) Fishermen from time to time face other expenses such as repair and maintenance of boat, food, license. This was estimated at 5 percent of the operating cost.

	$	
ice	63.00	The total operating cost per fisherman of
gear	320.00	**Type A = $817.95**
fuel	396.00	
misc.	38.95	**$818**
Total	817.95	= **$818**

Fishermen's costs **TYPE B**

(This group of fishermen are those not involved with the co-operative. They are irregular operators).

Operational costs of this category of fishermen was difficult to determine within the given time of survey. An estimation of their operating costs is given:-

One quarter of fuel and gear cost faced by the co-operative fishermen. Ice cost is excluded as its use by this group is minimal. Maintenance cost is also minimal as

most of this group of fishermen do not use boat all the time and some of them also do not own boats. They may hire a boat or go out fishing with others, in such a case they need to contribute towards fuel costs.

= 0.25 x (320 + 396) = $179

Fishermen's Production Levels

TYPE A:

Production is based on catch levels from 1993 and 1994.

1993 - 7056.9 kg
1994 - 5917.0 kg

This was the total production recorded in the co-operative purchases book. Thus the average production of the 17 co-operative members is as follows :

1993 : 7056.9/17 = 415 kg
1994 : 5917.0/17 = 348 kg

$$\text{Average production} = \frac{(415 + 348)}{2}$$

$$= 381.59$$

Rounded to 382 kg

* Determining average production per fisherman with any accuracy is impossible, since there are wide variations on the frequency of fishing trips, level of effort, and the number of fishing days. This can be clearly seen from details on individual fisherman's production details in part C. The average level of catch received from an individual fisherman per week or per month is an unreliable estimate to determine the level of productivity by individuals. Production by fishermen chosen at random reveals that some may only sell once or twice per month where as others may sell over ten times per month.

For the proposed project to break-even, average production per fisherman (assuming that all village households will participate) should be around 48 kg per month or 12 kg per week. In real terms, production should be much higher than the above given levels as fishermen do not fish throughout the year for various reasons such as seasonality, weather and other social commitments. In other words, if the fishermen have less number of fishing days per year, then the expected level of productivity per individual should be much higher per fishing trip in order to meet the targeted level of production.

From the records, less than five out of seventeen fishermen have consistently caught and sold fish and their production levels are much higher than those who

have only sold fish to the co-operative once or twice over the study period (April and December - 1993, 1994). During this period, the highest catch recorded per month from a regular fisherman was 271.20 kg and the lowest recorded catch was 0.1 kg.

TYPE B:

To determine the production level from these semi-subsistence fishermen was difficult.

However, from the general household interviews in Kaba, these semi-subsistence fishermen recorded an average weekly income of $20 from the sale of marine products. Sale of these products took place twice a month (on average), giving an income of $20 x 2 x 12 months = $480.00 per year.

Given the average market price of fish as $2.50, the annual production for market by this category of fisherman is estimated to be 192 kg.

III . Projections in Production and Costs

Production

With the establishment of a storage and freezing plant, ice would be readily available to the fishermen who can stay longer at sea and cover larger areas of fishing grounds.

It is assumed that the current fishing technology in terms of vessels, gear and equipment used would be retained with only some additional purchase of hooks and fishing line. Upgrading of technology would first require details on resource potential and type of fishing grounds. This is also likely to change the entire cost estimates of the project and would require a re-evaluation of the proposal and the project.

Given that the current level of technology would be employed, fishermen would be able to spend more time and travel longer distances as there would be adequate storage available for the catch. Production is estimated to double from the current level. It is also believed that with the project in place, fishermen would have adequate incentive to work on a regular basis.

Prior to Project : Type A Average annual production per fisherman: 382 kg
Type B Average annual production per fisherman: 192 kg

With Project: Type A (Production increase by 100 percent) 382 x 2 = 764

Type B 192 x 2 = 384

1,148kg

Average production under type C = $\frac{1148}{2}$

= 574 kg

Projected costs

Fishing for longer hours and distances would also increase costs of fuel and ice. Other operating costs such as gear costs is also likely to increase. If fishermen carry out more deep sea or outer reef fishing using lines, then cost of fishing nets would go down and other gear cost such as lines, hooks and bait would increase.

Since the vessel technology is assumed to remain the same, operating costs is projected to increase by one third (33 percent) from the current operating cost levels.

	Current level ($)	Projected level ($)
Type A :	$818	$1,088
Type B :	$179	$ 238.07

Projected average cost per fisherman : $1326.07/2 = $663

Other Details

i) With the implementation of the project, it is assumed that the whole village (23 households) will participate.

ii) The discount rate used to determine the financial viability is 12 percent (bank lending rate to fishing industry).

APPENDIX. III

Estimation of Income for the Co-operative Terminal Operation

i) Sale of fuel

Estimated fuel requirement (increase by 33 percent from current operations)

Type A:	$396 x 17 fishermen	=	$6,732
Type B:	$ 99 x 6 "	=	$ 594
	$7,326 x 1.33	=	**$9,743.58**

Pre-mix per litre = $0.75
= 12,991.4 litres as estimated use

Mark - up of $0.10 per litre will give revenue of $1,299.14

ii) Fish price mark - up of $0.50/kg = 13,202 kg x $0.50 = $6601

iii) Rent of equipment,miscellaneous use by fisherwomen, use by villagers for storage of other things, and use by people from surrounding villages. This has been estimated as $12,570 which may be rather optimistic.

iv) Fuel cost for the co-operative punt: (based on current weekly cost estimates) $40 per trip to the landing (Mataidreketi/Nakelo)
$40 x 50 weeks = $2,000

v) Transport cost from landing to Nausori market: hire of carrier - $20 per trip x 50 trips = $1000

APPENDIX IV

The average catch received by the co-operative per month for 1993 and 1994.

1993 :

Total annual catch = 7056.9 kg 7056.9/12 = 588.08

Average monthly catch received by the co-operative during 1993 = 588.08 kg per month

The average productivity per fisherman selling to the co-operative =

588.08/17 = 34.6 kg/ per fisherman/month

or

Average catch received by the co-operative per week:

588.08/4 = 147.02 kg per week.

This gives average weekly productivity per fisherman selling to the co-operative of: 147.02/17 = 8.65 kg/ per fisherman/week

1994 :

Total annual catch = 5917.0 kg
Average monthly catch received by the co-operative during 1994 =

5917.0/12 = 493.08 kg per month

This gives average productivity per fisherman selling at the co-operative of:

493.08/17 = 29 kg/ per fisherman /month

or

Average catch received by the co-operative per week : 493.08/4 = 123.27 kg per week.

This gives average weekly productivity per fisherman selling to the co-operative of: 123.27/17 = 7.25 kg/ per fisherman/week.

The average level of catch received from an individual fisherman per week or per month is an unreliable estimate to determine the level of productivity by individuals. Production by fishermen chosen at random does reveal that some may only sell once or twice per month where as others may sell over ten times per month. Refer to Graph I & II.