2A/3

THE NEARSHORE FISHERIES IN CENTRAL VISAYAS, PHILIPPINES: AN IMPACT EVALUATION REPORT OF CVRP-I[1]

by Marian S. delos Angeles
and Ramyleo Pelayo[2]

Introduction

The Philippine municipal small-scale fisheries provides livelihood for much of the archipelago's coastal population and is a significant supplier of the country's protein requirements. To increase fish production and improve fisherfolk's income, the government implemented a nationwide credit assistance program in the seventies. Livelihood gains appear to have been short-lived as the credit program which was tied to improved capital inputs increased entry into the fisheries. Thus, the twin problems of poverty and dwindling fishery resources continue to feed each other, and experts agree that the potential yield from the nearshore fisheries may already have been reached or even exceeded.

The Central Visayas Regional Project - Phase I (CVRP-I) is the country's first attempt at implementing region-wide community-based management schemes for managing coastal resources, residual forests and upland agriculture areas. The project piloted resource conservation strategies at selected sites in the four islands of Central Visayas. These sites were characterized by low incomes, environmental stress and manageable microwatershed areas. CVRP-I was implemented during 1984-1991 through a loan from the World Bank. A Central Visayas Regional Project Office (CVRPO) administered the project activities and provided liason services among the communities, regional line agencies and the national government.

This paper summarizes an impact evaluation study conducted on the nearshore fisheries component of CVRP-I in 1992 (delos Angeles and Pelayo 1992). It draws from earlier studies on CVRP, primary data-gathering activities conducted by PIDS in 1992, and parallel evaluation studies on the project conducted by other groups in 1992.

Salient Features of the Nearshore Fisheries Component

As with the CVRP-I Upland Agriculture (UA) and Social Forestry (SF) Components, the strategies to achieve the objectives of the Nearshore Fisheries (NF) Component consisted of the

---

[1]Paper presented at the Fourth Annual Common Property Conference of the International Association for the Study of Common Property (IASCP), June 16-19, 1993, Manila, Philippines

[2]Fellow II and Research Associate, Philippine Institute for Development Studies.

following: (1)introduction of various technology and resource management interventions or activities; (2) community organization efforts; (3) infrastructure development; (4) training and (5) institutional development. Site Management Units (SMUs) were established for each of the five NSF project sites in Bohol, Cebu, Negros Oriental (Bindoy and Bayawan), and Siquijor (**Figure 1**), to assist the fishermen-cooperators in carrying out the programs under a co-management scheme.

The NF Component initiated various resource conservation and income-generating activities. Of the seven interventions implemented, four were designed to conserve, rehabilitate and enhance the fishery resources: establishment of artificial reefs (AR), fish aggregating devices (FAD), mangrove reforestation, and establishment of fish sanctuaries. These were expected to increase coastal resource productivities, fish catch and household incomes of the fishermen-participants in the designated areas.

Artificial reefs are known to renew fish abundance in damaged coral reef areas. The establishment of fish sanctuaries in coral reefs where no fishing is permitted allows fish stocks to replenish themselves. Fish aggregating devices (FADs), which like the ARs and coral reefs attract fish in search of food and shelter, serve as fishing aids and thereby help increase fishing income. Mangrove reforestation also enhances the fishery resources by serving as feeding, nursery and breeding grounds for many commercial species.

The expected benefits from these activities, some of which are depicted in **Figure 2**, have empirical basis from similar interventions elsewhere, and if fishing is properly regulated such positive results may be sustained in the long run.

Management of nearshore resources was done through the building of community organizations in the form of fishermen's associations. ADFI (1992) reports that a total of 114 FAs have been organized in all the project sites as of August 1992. These associations became the entry points for the SMUs to implement the various interventions, including the guarding of fish sanctuaries against violators, information dissemination and training on fish conservation and management. Over a period of seven years (1984-1991), 182 barangays (barrios) participated in the various project activities which benefitted 8,086 families.

The role of the SMUs was crucial in organizing the fishermen and sustaining their interest and involvement in the project. Material inputs for the different activities were shouldered by the project, while labor was provided by the participating fishermen. The project thus emphasized the participatory approach to project implementation and resource management with the SMUs acting simply as facilitators and the fishermen themselves as project implementors and resource managers. CVRP-I is evidently the first attempt of a government machinery to undertake a community-based resource management in municipal fisheries on a regional basis.

The project achieved by end of 1991 nearly all the targets, even exceeding some of them, set for the period 1984-1990. In total, the physical accomplishments in all the project sites were as follows: management of fish sanctuaries covering 4,130 ha of coral reef areas, installation of

1,074 clusters of artificial reefs and 244 units of fish aggregating devices, reforestation of 974 ha of mangrove areas, issuance of 1,490 mangrove stewardship contracts, introduction of mariculture in 90 ha of farm sites, and dispersal/redispersal of 132 heads of livestock.

Extent of Adoption of NSF

CVRP-I's strategy of community-based resource management (CBRM) is aimed at ensuring sustainability of management efforts from the barangay to the regional level, in addition to enhancing equity in the potential benefits of such management. The incidence of involvement of target beneficiaries in various community organization and nearshore fisheries activities accelerated during the late eighties and peaked during 1988-89, the pre-planned final years of the project. On the other hand, infrastructure building shows late start-ups, as a general rule, with continuous increases until 1991.

There are expected differences in CO, NF and IN implementation across the project sites. Such differences are evident in the distribution of household participation in the various NSF activities (**Table 2**, **Figure 3**); this was caused by variations in management capabilities, biophysical site conditions, and phased expansion of the project. Fishermen's receptiveness to the interventions, also determined the project's level of impact on their individual and community welfare.

Based on the CVRPO 1991 Household Profile Survey, more than fifty per cent of household cooperators participated in artificial reef management in all sites except Cebu. In terms of coral reef management, Bohol, Siquijor and Cebu had high participation rates. At least a quarter of household beneficiaries conducted the recently-introduced mariculture activities in two sites (Siquijor and Bindoy, Negros Oriental), while the use of fish aggregating devices was prevalent in only the two Negros Oriental sites.

The same Household Profile indicates that 47 per cent of the total number of household cooperators conducted mangrove reforestation and management activities, with high prevalence in three of the five sites, i.e., the Negros-Bindoy, Bohol and Siquijor. However, only 41 per cent of these reforesting households had been issued mangrove stewardship contracts, with the following variations across sites: Bohol, 68 per cent; Siquijor, 48 per cent; Cebu and Bayawan at 26 per cent, and Bindoy at only 13 per cent.

Particularly noteworthy is the case in Bohol where 100% of the participants in mangrove reforestation in 8 barangays had been issued stewardship contracts, indicating the relative efficiency of the SMU there in facilitating the awarding of contracts. Most of these barangays were not involved in any other NSF activities, and in fact some beneficiaries were found to be non-fishing households, or at most part-time fishermen, during the field survey undertaken by this study.

The CVRPO Household Profile also sorted the household participants according to the number of NSF technologies or interventions in which they were involved. Majority of the households participated in one to three activities in all sites (**Figure 4**). Bohol, Siquijor and Cebu had the

most number of households participating in two activities, likely a combination of mangrove reforestation-stewardship contracts received or artificial reef- mangrove reforestation. The Bindoy site exhibited a wider spread in the number of activities of the participants. Again, this household distribution indicates the variations in the suitability of the sites to specific interventions and perhaps in the fishermen's attitudes and SMU efficacy.

Other data sources confirm such variations in the practice of introduced resource conservation efforts. For example, the differences in adoption of CVRP-initiated activities noted in the 1989 CVRP Benefit Monitoring Study (delos Angeles and Rodriguez 1989) continue to be detected in the 1992 PIDS Household Survey of NSF Sites. High participation rates in artificial reef construction (78 per cent), mangrove reforestation (73 per cent), barangay association meetings (57 per cent) and law enforcement (55 per cent) were reported by 40 cooperators (**Table 3**).

There are also spread effects in such practices among the non-targeted households. In particular, for the 35 respondent non-cooperators, artificial reef activities and mangrove reforestation are notable.

Impacts of CVRP-I NSF Component

Fish Catch

A survey conducted by the ADFI (1992) on 260 fishermen indicates increases in fish catch in the project sites where artificial reefs were installed. Gill net fishing in AR areas yielded 65 per cent increase in fish catch over the pre-CVRP levels while handline fishing rose by 107 per cent. The highest absolute increases of 174 per cent for gill nets and 141 per cent for handlines were recorded in Bohol and Negros Oriental, respectively (**Table 4**). Similar findings were reported by Guerrero (1990) in an earlier survey in Cebu where 90 per cent of the respondents experienced increased catches after the introduction of ARs.

However, Delmendo (1990) cautions against indiscriminate fishing in ARs since these devices mainly attract fish juveniles, and therefore recommends controlled fishing with the use of selective fishing gears that will not hasten the withdrawal of young stocks from the fish population. Apparently some fishermen's associations were aware of this danger and had imposed fishing restrictions by permitting only handlines and spearguns to be used in AR areas. But these groups allowed even non-members to fish there provided they observed the same gear restrictions. While such policy may make for good community relations, the level of individual catch rates may not be sustained over time if more fishermen partake of the resource. An alternative approach may be to designate a certain area of AR clusters as fish sanctuary like in coral reef management to serve as protected areas for rehabilitating the fish population in the adjacent fishing areas.

In another community, a group of non-participants set up their own AR out of resentment for not being invited to join the association. There were also reports of FADs installed by CVRP cooperators drifting out to sea or lost after their anchor lines were cut surreptitiously at night

by unknown persons. Such cases although isolated reflect the sensitivity of the problems in law enforcement and allocation in a regulated or managed fishery.

Both the ADFI and PIDS surveys have noted several accounts of ARs, either bamboo or concrete, being damaged, destroyed or lost in only a few months after installation. Questions have been raised about their design and durability. AR cooperators are expected to share the cost of restoring or replacing their reefs as envisioned in the project, but this did not happen probably because their incomes remained below the poverty line, despite the benefit of increased catches from ARs (ADFI, 1992).

There are indications of an increasing trend in the catch rates as a result of coral reef management, based on the ADFI analysis of the CVRP catch monitoring data and their own field survey of August 1992. On average, the 36 fishermen's associations sampled from all the sites reported an increase of over 80 per cent in daily catch rates after management measures were introduced. The respondent-associations attributed this benefit to the minimized illegal fishing activities and the established fish sanctuaries. Notably, both members and non-members experienced increases in their catches in reef areas adjacent to the sanctuaries.

High catch rates were obtained in FADs or "payaos" but more data are needed to assess this technology. The non-CVRP FADs yielded the highest fish catch compared to other types of fishing areas monitored by CVRPO in 1989-1991 (ADFI, 1992). The effect of mangrove reforestation on fish abundance would be difficult to quantify, but some fishermen have attributed increases in their catch to the rehabilitated mangrove areas near their fishing ground.

In the PIDS survey, the respondents gave mixed observations regarding changes in the resource base. Among those CVRP fishermen cooperators and non-cooperators who observed increases in fish abundance and catch, the most frequently cited factors are minimized illegal fishing due to improved law enforcement activities, presence of artificial reefs, installation of fish aggregating devices, and mangrove reforestation. On the other hand, fishermen who noted decreases or no change in fish catch put the blame on the increased total fishing effort brought about by more fishermen, more kinds of fishing gear, encroachment by commercial fishing operations and other illegal fishing methods (**Table 5**).

Ironically, the positive effects of the management interventions may have encouraged new entries into the fisheries. Some respondents, in fact, reported changing their gear to more efficient types (e.g., from single hook-and-line to gill net or fish pot); part-time fishermen with no gear were constructing their own beach seines and gill nets during the field visits.

Resource Productivity

The above changes in fish catch are merely indicative of the effects attributable to the various interventions. Inadequacies in the available fish catch and effort data, as the ADFI report noted, precluded a more reliable quantitative evaluation. A resource assessment program should be an integral part of similar management projects in fisheries where changes in fish abundance over

time are not readily visible nor measurable. Local expertise in assessing multi-species, multi-gear fisheries may be tapped in planning and implementing such a program. The data to be generated will help determine the biological status of the resources, the current level of exploitation, the maximum economic yield and the corresponding fishing effort level. Such information can provide the scientific basis for user rights allocation and other fishery regulations.

The project's accomplishments in terms of hectares covered, units installed, and number of household participants vis-a-vis the targets do not give the total picture of how the project has achieved its objectives. Field interviews revealed that several of the artificial reefs, FADs and mangrove plantations were no longer extant, either destroyed by typhoons or lost due to other causes. Data on such losses or mortalities may have been documented in some SMU reports but these are not available in summarized form that could help in assessing the success of the interventions as well as in re-designing future projects.

Much of these unexpected effects arises from the pilot nature of CVRP-I: the project to a certain extent experimented with various nearshore conservation technologies under previously untried conditions.

Determinants of Impact

To explore further the mechanism through which community-based resource management activities impact on CVRP adopters' quality of life, various regression analyses on different data sets were conducted.

Catch, effort and project duration relationships per fishing area and by fishing gear were estimated for all fishermen monitored during 1988-91 by CVRPO with the results presented in **Table 6.** For fishing in artificial reef either through fish corral or gill nets, and in coral reefs with the use of gill nets, increase in fishing effort raises fish catch. On the other hand, higher fishing effort through the use of fish corral in coral reefs and gill nets in the open sea tend to decrease fish catch.

This difference appears to signal varying degrees of depletion and productivity and, possibly, efficiency (and resource destruction) between fish corral and gill net technologies in the coral reefs. Fishing season's impact likewise varies across fishing area and gears. This may be attributed to differences in exposure to monsoon winds and other weather conditions across the fishing areas.

In all areas and regardless of fishing gear, the passage of time appears to enhance fish catch for all sites, as indicated by the statistically significant positive coefficients for year. This may be indicative of increased resource enhancement through time as a result of CVRP technology and management interventions.

While the relationships so derived were statistically significant, the model was not able to fully

capture all the determinants of fish catch. Thus, the model's low predictive capability deters its use for deriving projections on future fishing productivities.

When the regressions are estimated by fishing area and site, regardless of fishing gear, the results appear to be more consistent: higher fishing effort increases fish catch. The passage of time has more ambiguous results however: more years into CVRP reduced fish catch in Bohol, and otherwise for the other sites (**Table 7**). A more thorough biological stock assessment over time may provide the explanation for such variations in the state of the resources and possibly determine the amount of fishing effort the fisheries can sustain.

A major emphasis of CVRP-I is the control of fishing effort, in terms of shifting from destructive technologies towards safe ones, as well as providing respite for resource renewal by designating areas for fishing and for sanctuaries. While this may be observed from the cooperators of CVRP, it may not necessarily be the case among the non-cooperators. Access to improved resource productivity conditions has virtually been non- exclusive. This arises partly from the fugitive nature of fishery resources and the failure in general policy-making in implementing tools to regulate access to common property resources. With the open-access fishery near or just outside the established fish sanctuaries, and under conditions of high population pressure, it appears that the early gains from fishery conservation activities may not be sustainable in the long term.

The project's contribution in regulating fishing effort is investigated through the relationship presented in **Table 8.** The hypothesis pursued in the regression equation is: more intensive involvement in CVRP-I reduces fishing effort. The results for the community organization index (CO) and number of years passed with CVRP do prove this hypothesis. However, this is not true for nearshore fisheries activities (NF) and infrastructure (INF). It appears that the attractiveness of the potential gains from nearshore fishery activities and the enhanced access into the fishing areas due to better roads result in higher fishing effort. These empirical results signal the urgent need for regulating access to the coastal fisheries to maintain the gains from enhancing fish productivity.

Income Effects

In terms of impact on income, in all sites but Bindoy, Negros Oriental, mean incomes of the non-adopters were higher than those of the adopters in 1991 (**Table 9**). In fact, while both groups appear to have comparable incomes in 1988, adopters' income rose by 9.9 per cent during 1988-1991 while the income of non- adopters increased by a higher 22.6 per cent during the same period. It appears that the problem of non-exclusion has resulted in the larger portion of the gains from CVRP to have been captured by the non-CVRP participants (**Table 10**).

While these results are disconcerting with respect to fairness in the distribution of private costs and benefits of CVRP, there is more reason to be optimistic in terms of alleviating poverty. **Table 10** indicates that all those surveyed, whether cooperators or non-cooperators, were way below the poverty thresholds for Region 7 in 1985. Increases in their incomes brought both

groups closer to the poverty thresholds in 1988. Thus, as a project that is designed to uplift the rural poor, CVRP has achieved considerable initial gains.

However, since both groups are still below the poverty thresholds, changes in the quality of life have not yet occurred. This is reflected in the various indicators; for example, some fishermen do not own fishing craft or gear, which could explain their low fishing incomes since they either borrow their equipment as part-time fishermen or serve as fishermen-crew to some owner-operator who give them a limited share of the income.
A potential significant contributor to future income increases is mangrove reforestation. Here increased supply of wood and non-timber products, particularly gathered aquatic products on the site, would enhance the livelihood of the adopter communities. In addition, where stewardship contracts do limit the use of the resources in mangrove reforested areas, the benefits are expected to accrue to CVRP participants more directly. Measurements of such potential benefits were not feasible, however, because of poor data on the areas effectively reforested and the absence of growth and yield models on reforested mangroves. The high mortality rates in some sites result from poor growing conditions and weather patterns and the experimental nature of CVRP. There is also undermeasurement of the early impacts of mangrove rehabilitation in terms of non- coverage/non-reporting of household consumption of gathered products (such as crustaceans and bivalves).

Data on production and income from mariculture and livestock dispersal activities were not obtained. Respondents in Siquijor reported favorable results in CVRP-introduced seaweed farming activities which was seasonal in the area. Apparently one such farm was operated by a fishermen's association, the earnings from which served as revolving fund for the organization. A worthy suggestion came from Bohol respondents: conduct a livelihood program for fishermen's wives. Such undertaking would not only increase family incomes but could also serve as incentive for participation in CBRM activities.

Qualitative Assessment

Perceptions on the Quality of Life

Despite the persistent poverty among them, the respondents' perception on their quality of life tends to be more optimistic, perhaps reflective of the general increase in their fishing incomes. There is a dominant perception of improvements in socioeconomic conditions. A most often cited form of improvement expressed by the cooperators during the interview is the increased availability of fish for home consumption.

When asked to compare their present socioeconomic condition to that prior to CVRP intervention or 5 years ago, more cooperators believed they were better off now (43-48%) than the non-cooperators did (17-23%). About the same proportion of the two groups thought their socioeconomic status did not change. A fairly good number (35%) of the cooperators attributed their improved conditions to their participation in CVRP.

The most frequently mentioned factors that brought about this change were increased catch, minimized illegal fishing and the CVRP activities such as AR, FAD, fish sanctuary establishment, and mangrove reforestation. Those who perceived there was no change in their status mainly cited the increase in the number of fishermen and fishing methods. The CVRP may also be credited for introducing activities and developing conservation-awareness among the fishermen that would benefit them and the resource they depend on in the long run.

The same positive self-assessment was evident among the cooperators when comparing their status with other members of the community: 40 per cent of them perceived themselves as better off, while only 17 per cent of the non-cooperators believed the same. The economically better-off members attained such status because they have other sources of income, such as fish buy-and-sell, sari-sari store and farming. If a trend of shifting their livelihood from fishing to other activities is established over time, and new entries to the fishery are limited, such developments will certainly relieve the pressure on the resource, improve their household incomes, and ensure sustained yields for those who remain in the fishery.

Perceptions on the CVRP

The opinions expressed by the respondents on the most important contribution and weaknesses of the CVRP are instructive for planners and implementors of similar projects. Both the cooperator and non-cooperator groups cited as CVRP's most important contributions the mangrove reforestation and artificial reefs project activities. This perception could have resulted from their actual experience of better catches in AR areas and increase in fish abundance attributed to mangrove reforestation, as well as the promise of greater income from mangrove resources as these grow in time.

The responses regarding the weaknesses of CVRP do not pinpoint a singularly common attribute. It is worth noting, nevertheless, that there is dissatisfaction on the effectiveness and durability of the ARs and disappointment on some aspects of CVRP management like inadequate information dissemination and lack of follow-up. This last comment was encountered quite frequently in informal interviews, indicating that CVRP management abandoned some areas or some projects after the initial activities, or failed to sustain the crucial aspect of community organizing work.

The ADFI survey also cited several shortcomings that raise doubts about the sustainability of the interventions and the capabilities of the institutions to pursue the community-based resource management program beyond the lifetime of the project. These include weak leadership and management capabilities of loosely-organized fishermen's associations, inadequate technical assistance from the SMUs at the project sites, lack of support from local government units (LGUs) and police agencies in imposing penalties on apprehended violators of fishery regulations, and most significantly the absence of a national policy on allocation of fishery rights.

The project's experience in coral reef management is illustrative. After the SMUs and the

Department of Agriculture/Bureau of Fisheries and Aquatic Resources staffs helped organize a fishermen's association, a municipal ordinance or resolution was prepared with SMU assistance establishing a fish sanctuary. The area was marked off by buoys and anchor warps provided by the SMU; visits to coral reef sanctuaries elsewhere by fishermen leaders were sponsored by CVRP. The sanctuary declaration embodied in the ordinance, however, has to be endorsed first by a higher body, the Sandigang Bayan, and finally approved by the Department of Agriculture. The process has been slow and no application has reportedly been approved. With no authority over the area, the association could only persuade other fishermen not to fish in the sanctuary, while assistance from local law enforcers has been unreliable. In areas with strong local government support, illegal fishing activities were minimized. But some LGUs are constrained by lack of equipment like patrol boats and radios.

Present weaknesses and inadequacies can serve as valuable lessons for future refinements and directions. Membership in the associations needs to be expanded to at least the majority of the local fishermen to guarantee a wider cooperation in implementing management measures. (The 5,000 to 8,000 participants in the NSF component represent less than half of the 20,000 fishermen recorded by the 1980 census in the NSF project sites.) The fishermen's association may evolve or transform into formally organized cooperatives, as ADFI suggests, to enjoy such benefits as loans for AR construction and better fishing gear for offshore fishing, and to serve as partners of LGUs and regional line agencies for implementing an appropriate management program.

The role of LGUs and the extent of their authority in resource management should be examined. For example, the present licensing system for municipal fishermen may be used as a coercive tool for ensuring compliance with fishery regulations and even membership in fishermen's organizations. The proposed Fishery Code in a pending bill may provide the national policy for aquatic reform where local communities are given the right and responsibility to manage the resources under their jurisdiction. The criteria for allocating user rights may be decided upon through consultations among organizations and institutions concerned, and may include such considerations as dependence on fishing for livelihood, other sources of income, record of violation or observance of fishery laws, age and educational attainment, among others.

Conclusions

The CVRP-I has laid the groundwork for a community-based resource management regime in the region. Fishermen's associations have been organized and enlightened on the value of fish conservation and management. The positive contribution of CVRP in increasing catch and incomes of the poor fishing household warrant continued efforts in its resource management schemes into the future. There is a need, however, to guarantee exclusion in access to the project's gains through a well-defined system of property rights for the cooperators, and a system of payments by the non-cooperators who also benefit from the project activities.

Differences in the marine environment and natural endowments (coral reefs, shoreline configuration, area, water depth, topography, etc.), and climate factors among the project sites

obviously determine the appropriate type and extent of interventions that could be introduced, which in turn limit the number of target beneficiaries for each site. For the artificial reef and mangrove reforestation activities, the allocation scheme, as originally planned, was supposed to confer user rights only to full-time fishermen without motorized bancas. Deviations from this plan were evident, however, during field interviews with the beneficiaries.

While the maintenance of fish sanctuaries and rehabilitation of mangroves benefit the fishermen non-cooperators as well, given the mobility of the fishery resources and the open access to them, the other project interventions bestow upon the individual participants certain exclusivity to the benefits. The issuance of Stewardship Contracts (SC) or Mangrove Stewardship Agreements (MSA) gives the designated cooperators in mangrove reforestation the right to gather timber, shellfish, fry and other resources in the replanted areas under their care. Mariculture projects, such as seaweed farming and livestock dispersal and redispersal activities likewise augment the household incomes of only a few selected participants. These interventions represent another approach to alleviating poverty among small fishermen, that is, by generating income from activities other than fishing.

The issue of allocation will become more pressing in the face of dwindling resources and persistent poverty in coastal areas. Since any management measure has income-distribution effects, this is a sensitive aspect that requires serious consideration. A well-established, community-based resource management system may provide, through consensus, the acceptable and equitable scheme to meet this problem.

In the event that some competition would arise in fishing grounds common to several communities, such as in straits between Cebu and Negros Oriental, it is important for a regional body to provide the role of arbiter. By such time, the CVRP shall have to evolve into a truly regionwide project and would have to provide the conditions for voluntary solutions to common resources allocation to occur.

Legal instruments have to be promulgated and enforced to provide the policy framework and define the responsibilities of fishing community organizations, governmental institutions, non-governmental organizations (NGOs), and regional political units under a joint management arrangement. Fishermen's organizations, with the help of local NGOs, should be encouraged to form federations at the provincial and regional levels to share information and experience, exchange visits and expertise, and develop a regionwide commitment to a common purpose.

REFERENCES

Aquafarming Development Foundation, Inc. (ADFI). 1992. Resources assessment and fish catch data analysis of the CVRP-I Adopter Fisheries Component. Final Report. ADFI, Quezon City.

CVRP-I Annual Progress Reports. 1988-1991.

CVRPO. 1991. Barangay Household/Adoption Profiles: Adopter Fisheries, as of December 1991.

CVRPO. NSF Fish Catch Monitoring Data, 1988-1991.

Delmendo, M.N. 1991. A review of artificial reefs and use of fish aggregating devices (FADs) in the ASEAN region. IPFC Symposium on Artificial Reefs and Fish Aggregating Devices as Tools for the Management and Enhancement of Marine Fishery Resources. RAPA Report: 1991/11. [Cited in ADFI, 1992]

delos Angeles M.S. and R. Pelayo, 1992. The CVRP-I Nearshore Fisheries Component: Impact Evaluation Report. Final Report submitted to the Central Visayas Regional Project Office, December 1992.

delos Angeles, M.S. and E. Rodriguez. 1992. Measuring benefits from natural resources conservation: The case of Central Visayas Regional Projects. PIDS Working Paper No. 92-04.

Guerrero, C. 1990. A survey of the socio-economic conditions of small-scale fishermen involved in artificial reefs development in Cebu. ASEAN/UNDP/FAO Small-Scale Fisheries Development Project. [Cited in ADFI, 1992]

Handbook in the Teaching of Elementary Agriculture (Pursuant to DECS-MEC and CVRPs Philosophy, Concept and Technology), Gr. IV-VI Volumes. CVRP-I.

NSCB. 1985, 1988, and 1990. Philippine Statistical Yearbook.

NSO. 1985 and 1988. Family Income and Expenditures Survey (FIES).

Table 1
PHYSICAL TARGETS (REVISED) & ACCOMPLISHMENTS
Nearshore Fisheries Component
As of December 1991

NEARSHORE FISHERIES	5 YEAR TARGET	1984–1990 ACCOMPLISHMENTS	CY 1991 ANNUAL TARGETS	CY 1991 Jan.– Dec. ACCOMPLISMENTS	% ACCOMPLISHMENTS (As of Dec. 1991) OVER 5–YR.	% ACCOMPLISHMENTS (As of Dec. 1991) OVER CY 1991
Barangays Covered (no.)	180	163	17	19	101.1 %	111.1 %
Families Benefited (no.)	6,069	8,086	0	NA	133.2 %	NA
Artificial Reef Clusters	1,236	929	307	145	86.9 %	47.2 %
Mangrove Reforestation (ha.)	1,000	919	135	55	97.4 %	40.4 %
Coral Reef Area Mgt. (ha.)	3,716	2,902	1,344	1,228	111.1 %	91.4 %
Livestock Dispersed (no.) *	63	63	0	0	100.0 %	NA
Livestock Redispersed (no.)	76	45	20	24	90.8 %	120.0 %
Stewardship Contracts (no.)	1,736	1,255	525	235	85.8 %	44.8 %
FADs (unit)	237	212	52	32	103.0 %	61.5 %
Mariculture (ha.)	48	33	15	57	186.5 %	376.9 %

Note: * New intervention implemented early '87

Source: CVRP–I 1991 Progress Report, p.8

Filename: Tab1.wk1
4 Dec 92
lay

Table 2
NUMBER OF HOUSEHOLD PARTICIPANTS BY NSF TECHNOLOGY/MANAGEMENT INTERVENTIONS

NSF ACTIVITY/ INTERVENTION	ALL SITES	BOHOL	CEBU	NEGROS OR. (BINDOY)	NEGROS OR. (BAYAWAN)	SIQUIJOR
1. Artificial Reef Management Activities	2,964 (55)	714 (53)	585 (44)	613 (66)	319 (52)	733 (61)
2. Mangrove Reforestation & Management	2,539 (47)	769 (57)	484 (36)	559 (60)	119 (20)	608 (51)
3. Coral Reef Area Management Activities	2,385 (44)	678 (50)	711 (53)	283 (30)	12 (2)	701 (58)
4. Mariculture Activities	843 (16)	47 (3)	171 (13)	246 (26)	51 (8)	328 (27)
5. Livestock Redispersal	103 (2)	37 (3)	25 (2)	24 (3)	0 (0)	17 (1)
6. Stewardship Contract(s) Received	1,047 (19)	522 (39)	126 (9)	74 (8)	31 (5)	294 (24)
7. Fish Attracting Device Activities	1,323 (24)	37 (3)	349 (26)	527 (57)	304 (50)	106 (9)
Total No. of Household Participants	5,419 (100)	1,346 (100)	1,331 (100)	931 (100)	608 (100)	1,203 (100)

Note: ( ) means % to total

Source: CVRPO, 1991. Barangay Household/Adoption Profiles: Nearshore Fisheries, as of December 1991.

nsfhhtb.wk1
12-4-92
lay

Table 3
FREQUENCY COUNTS OF RESPONDENTS' INVOLVEMENT IN CVRP ACTIVITIES, 1992

ACTIVITY	COOP.		NON-COOP		COOP.		NON-COOP		COOP		NON-COOP		COOP		NON-COOP	
	NSF-BOHOL				NSF-CEBU				NSF-NEGROS (BINDOY)				NSF-SIQUIJOR				NSF-ALL SITES			
	N = 13		N = 13		N = 10		N = 8		N = 8		N = 8		N = 9		N = 6		N = 40		N = 35	
Project/Barangay planning	2	15%	1	8%	2	20%	0	0%	3	38%	1	13%	5	56%	0	0%	12	30%	2	6%
Barangay Association meetings	6	46%	1	8%	8	80%	0	0%	3	38%	0	0%	6	67%	1	17%	23	57%	2	6%
Barangay Committee meetings	5	38%	3	23%	4	40%	0	0%	2	25%	1	13%	4	44%	1	17%	15	38%	5	14%
Barangay Development Council	2	15%	1	8%	1	10%	0	0%	1	13%	1	13%	3	33%	0	0%	7	18%	2	6%
Training and manpower development activities	1	8%	0	0%	5	50%	1	13%	2	25%	0	0%	7	78%	0	0%	15	38%	1	3%
Research activities	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Development communication activities	1	8%	0	0%	0	0%	0	0%	0	0%	0	0%	1	11%	0	0%	2	5%	0	0%
Barangay-level monitoring activities	1	8%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	3%	0	0%
Nursery establishment	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	11%	0	0%	1	3%	0	0%
Nursery maintenance	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	11%	0	0%	1	3%	0	0%
Land tenure settlement activity	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	11%	0	0%	1	3%	0	0%
Artificial reef activities	9	69%	2	15%	10	100%	2	25%	7	88%	3	38%	5	56%	0	0%	31	78%	7	20%
Mariculture/seafarming	0	0%	0	0%	1	10%	0	0%	0	0%	0	0%	3	33%	0	0%	4	10%	0	0%
Coral reef fish sanctuary	0	0%	0	0%	3	30%	0	0%	0	0%	0	0%	1	11%	0	0%	4	10%	0	0%
Fish attracting device	0	0%	0	0%	3	30%	0	0%	2	25%	0	0%	3	33%	0	0%	8	20%	0	0%
Mangrove reforestation	12	92%	1	8%	5	50%	1	13%	7	88%	3	38%	5	56%	0	0%	29	73%	5	14%
SC/MSA	1	8%	0	0%	1	10%	0	0%	0	0%	0	0%	1	11%	0	0%	3	8%	0	0%
Livestock dispersal	1	8%	0	0%	0	0%	0	0%	1	13%	0	0%	0	0%	0	0%	2	5%	0	0%
Miracle hole in mangroves	2	15%	0	0%	2	20%	0	0%	0	0%	0	0%	0	0%	0	0%	4	10%	0	0%
Law enforcement	5	38%	2	15%	7	70%	0	0%	5	63%	1	13%	5	56%	0	0%	22	55%	3	9%
No answer	0	0%	10	77%	1	10%	5	63%	1	13%	4	50%	1	11%	4	67%	3	8%	23	66%

Source PIDS Household Survey of CVRP Nearshore Fisheries Sites, 1992

nsf-tab2 wk1
12/5/92

Table 5
OBSERVED CHANGES IN RESOURCE BASE/FISHING ACTIVITIES AFTER CVRP INTERVENTIONS, 1992

COOPERATORS	X	NON-COOPERATORS	X
In Fishing Ground			
Increased fish abundance and catch	17	Increased fish abundance and catch	7
Illegal fishing now minimized	7	Illegal fishing now minimized	7
Decreased catch due to more fishermen	6	Less catch due to more fishermen and fine-meshed nets	7
Fishing area now farther due to presence of sanctuary	1	No change	10
No change	3		
In Fishing Time			
No change	18	No change	18
Same or more catch for less fishing time	3		
In Fishing Gear			
No change	19	No change	16
Changed to more efficient gear	2	Changed to more efficient gear	3
More illegal fishing before	1	More kinds of fishing gear now	1
Illegal and commercial fishing are still operating	1		
No answer	4		7

Note: X = no. of times mentioned

Source: PIDS Household Survey of CVRP Nearshore Fisheries Sites, 1992

nsfsumts.wk1
11/30/92

Table 4
AVERAGE FISH CATCH PER DAY OF FISHERMEN BEFORE AND AFTER THE INTRODUCTION OF ARs IN THE PROJECT SITES (AUGUST 1992)*

Project Sites	Fishing Gears						Total No. of Respondents
	Gill Net			Handline			
	Before	After	% Increase	Before	After	% Increase	
Bohol	3.21	8.79	173.83	1.95	4.46	128.71	47
Cebu	6.90	8.36	21.15	2.13	4.08	91.54	77
Negros Oriental	4.09	8.81	115.40	1.55	3.73	140.64	40
Siquijor	3.49	5.71	63.61	1.30	2.51	93.07	96
Average catch/day for all sites	4.54	7.52	65.60	1.70	3.52	107.06	260

Note: * Average number of fishing days = 15

Source: ADFI (1992), Table 30, p. 20.

adfitab1
12/3/92

Table 6

REGRESSION OF FISH CATCH ON SELECTED VARIABLES, BY FISHING AREA AND FISHING GEAR, ALL NSF SITES

Fishing Area/ Gear	n	Independent Variables: Intercept	Effort (man-days)	Year	Season	F	$\bar{R}^2$
Artificial Reef/ Fish Corral	287	0.133	0.093 **	0.895 ***	-0.024	13.205 ***	0.113
Artificial Reef/ Gill Net	3,775	1.377 ***	0.186 ***	0.147 ***	-0.174 ***	41.076 ***	0.031
Coral Reef/ Fish Corral	331	-0.288	-0.098 ***	1.063 ***	0.353 ***	16.174 ***	0.121
Coral Reef/ Gill Net	801	1.216 ***	0.414 ***	0.067	0.108	27 492 ***	0.090
Open Sea/ Gill Net	1,396	0.594 ***	-0.219 ***	0.456 ***	0.341 ***	55.912 ***	0.106
Payao	293	1.119 ***	0.233	1.504 ***	-0.767 ***	5 907 ***	0.048
Sea Grass/ Gill Net	413	0.985 ***	0.000	0.637 ***	-0.370 ***	9.879 ***	0.061

Notes: a. Equation estimated is:

log Fish catch (in kg) = a + b log Fishing Effort (person-days) + c log Time (t = 1, 1988, = 2, 1989, = 3, 1990, = 4, 1991) + d log Season (2=Jan-June, 1= Jul-Dec)

b. *** Significant at 5 per cent level
** Significant at 10 per cent level
* Significant at 15 per cent level

c. Effort per trip, in person-days = (No of Hours / 8 hours) X (Crew)

Source of basic data: CVRPO, NSF Fish Catch Monitoring Data, 1988-1991

C-tab6.wk1
6-15-93
rp

Table 7
REGRESSION OF FISH CATCH ON EFFORT AND TIME
BY FISHING AREA AND PROVINCE

Fishing Area/ Province	n	Independent Variable Intercept	Effort (personhours)	Year	F	R^2
ARTIFICIAL REEF						
Bohol	4,552	4.0723 ***	0 3125 ***	−0.3506 ***	47.01 ***	0.02
Siquijor	2,551	−2.0050 *	0.0484 *	2.1513 ***	15.19 ***	0.01
Cebu	2,241	−2.5835	0.2706 ***	4.1530 ***	47.33 ***	0.04
Bayawan, Neg Or	615	4.0512 ***	0.0626	0.0511	0.52	0.00
Bindoy, Neg Or	2,391	−0.8008	0.3093 ***	2.2423 **	57.74 ***	0.04
CORAL REEF						
Bohol	4,063	3.9360 ***	0.4453 ***	−1.0264 ***	226.97 ***	0.10
Cebu	909	−1.6172	0.0235	2.1135 ***	17.10 ***	0.03
Bindoy, Neg Or	630	−1.4044	0.6082 ***	0.7389	54.42 ***	0.14
OPEN SEA						
Bohol	744	1.0843	0.0443	2.3689 ***	11.00 ***	0.03
Siquijor	110	−8.0573 ***	1.6264 ***	2.7238 ***	23.46 ***	0.29
Cebu	654	−16.2406	2.4624 ***	5.9151	97.97 ***	0.23
Bindoy, Neg Or	3032	−6.4017 ***	0.0339 ***	4.4826 ***	199 83 ***	0.12
FAD/Payao						
Bohol (non−CVRP)	95	40.1397 **	3.5948 ***	−18.5800 ***	24.98 ***	0.34
Cebu (CVRP)	440	15.7540 **	0 9337 ***	−0.5152	36.16 ***	0.14
Cebu (non−CVRP)	919	22.7112 *	1.0601 ***	0.2114	89.25 ***	0.16
Bayawan, NO (non−CVRP)	358	−2.0855	2.0704 ***	−0.3745	84.03 ***	0.32
Bindoy, NO (CVRP)	60	−7.2183 ***	−0.0136	3.0515 ***	9.75 ***	0.23
Bindoy, NO (non−CVRP)	1034	−1.9189	−0.5346 **	4.3088 **	3.26 ***	0.00
SEA GRASS						
Bohol	582	7.6390 ***	−0.1474 ***	−1.0784 ***	33.69 ***	0 10
Bindoy, NO	484	−10.4178 **	0.2867 ***	5.3564 ***	11.43 ***	0.04
FISH SANCTUARY						
Bindoy	719	−9.3492	0.1499 ***	7.4748	15.73 ***	0.04

Notes:

a. Equation estimated is:

Fish Catch (in kgs) = a + b (Fishing Effort (person−hrs) + c (Time (t = 1, 1988, = 2, 1989, = 3, 1990, = 4, 1991)

b. *** significant at 5 per cent level
** significant at 10 per cent level
* significant at 15 per cent level

c. Effort per trip (in person−hrs) = (Fishing Time, in hrs) X Crew

Source of basic data: CVRPO, NSF Fish Catch Monitoring Data, 1988−1991

c−tab8.wk1
6−15−93
rp

Table 8
REGRESSION OF FISHING EFFORT ON NSF ACTIVITIES AND TIME,
SELECTED CASES FROM CVRPO FISH CATCH MONITORING DATA, 1988–1991

Independent Variable	Mean Values	Coefficient	T–value
Intercept		0.403	
Community Organization (CO) Index	426.6	–1.471	–1.907 **
Nearshore Fisheries Technology Index (NSF)	613.3	0.614	3.155 ***
Infrastructure Index (INF)	94.4	1.176	1.734 **
Time (t)		–0.528	–2.290 ***

Adjusted $\bar{R}^2$ = 0.1134
F = 3.142 ***

Notes:

a. Equation estimated:
log (Effort, in man–hours per fishing trip)
= a + b log (CO) + c log (INF) + d log (NSF) + e log (t)

b. Based on data on 35 fishermen with daily observations greater than 100 cases per year, and observed for at least two years. (Source: CVRPO Fish Catch Monitoring Data).

c. CO, NSF & INF data from relevant scores in Table 3 of delos Angeles and Pelayo (1992) based on fisherman's residence, as observed from the CVRPO 1991 Household Profile.

c–tab8.wk1
6–15–93
rp

Table 9
TESTS FOR DIFFERENCES IN GROSS FISHING INCOME
CVRP–I PARTICIPANTS VS. NON–PARTICIPANTS, 1991

	n	MEAN INCOME (s.d.), in current pesos Cooperators	vs.	Non–Cooperators	t values	Conclusion
All Sites	75	20,946 (18,338)	<	28,235 (20,961)	(16)	significant at α = .10
Cebu	18	24,589 (12,179)	<	25,641 (9,306)	(0.2015)	n.s.
Negros Or.	16	28,642 (27,510)	>	23,442 (22,413)	0.4145	n.s.
Siquijor	15	16,188 (14,778)	<	43,060 (31,366)	(2.2519)	significant at α = .05
Bohol	26	16,703 (17,541)	<	25,939 (18,867)	(1.2929)	significant at α = .10

Source of basic data: PIDS NSF Survey, 1992

c–tab9.wk1
6–15–92
rp

Table 10
FAMILY INCOME, VARIOUS YEARS
In 1985 pesos

Year	Level		Gross Income, 1985 pesos	Data Source
1. Gross income from all sources				
1985	Region 7	P	20,756	Phil Statistical Yearbook
	Region 6	P	24,807	Phil Statistical Yearbook
1988	Region 7	P	25,581	Phil Statistical Yearbook
	Region 6	P	28,799	Phil Statistical Yearbook
Annual growth rate				
	Region 7		7.2%	Computed from figures above
	Region 6		5.1%	Computed from figures above
2. Gross income from fishing				
1988	CVRP Adoptors	P	9,496	1989 Benefit Monitoring Study
	CVRP Non-Adoptors	P	9,219	1989 Benefit Monitoring Study
1991	CVRP Adoptors	P	12,618	1992 Impact Evaluation Study
	CVRP Non-Adoptors	P	17,009	1992 Impact Evaluation Study
Annual growth rate				
	CVRP Adoptors		9.9%	Computed from figures above
	CVRP Non-Adoptors		22.6%	Computed from figures above
3. Poverty Threshold level (annual)				
1985	Region 7	P	23,844.00	NSO, FIES Data
	Region 6		29,436.00	NSO, FIES Data
1988	Region 7		24,847.71	NSO, FIES Data
	Region 6		30,451.38	NSO, FIES Data

tab13r.wk1
5 Dec 1992

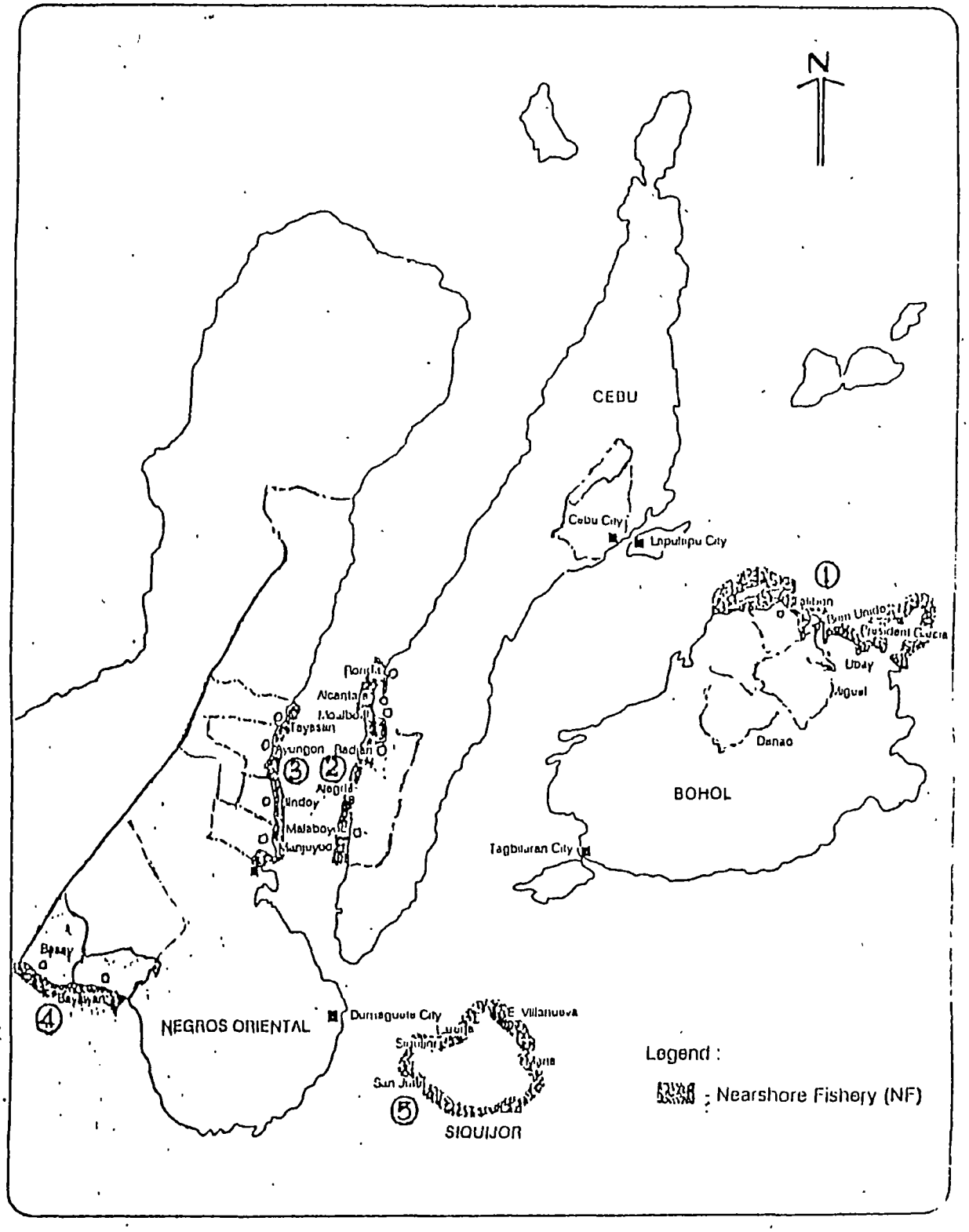
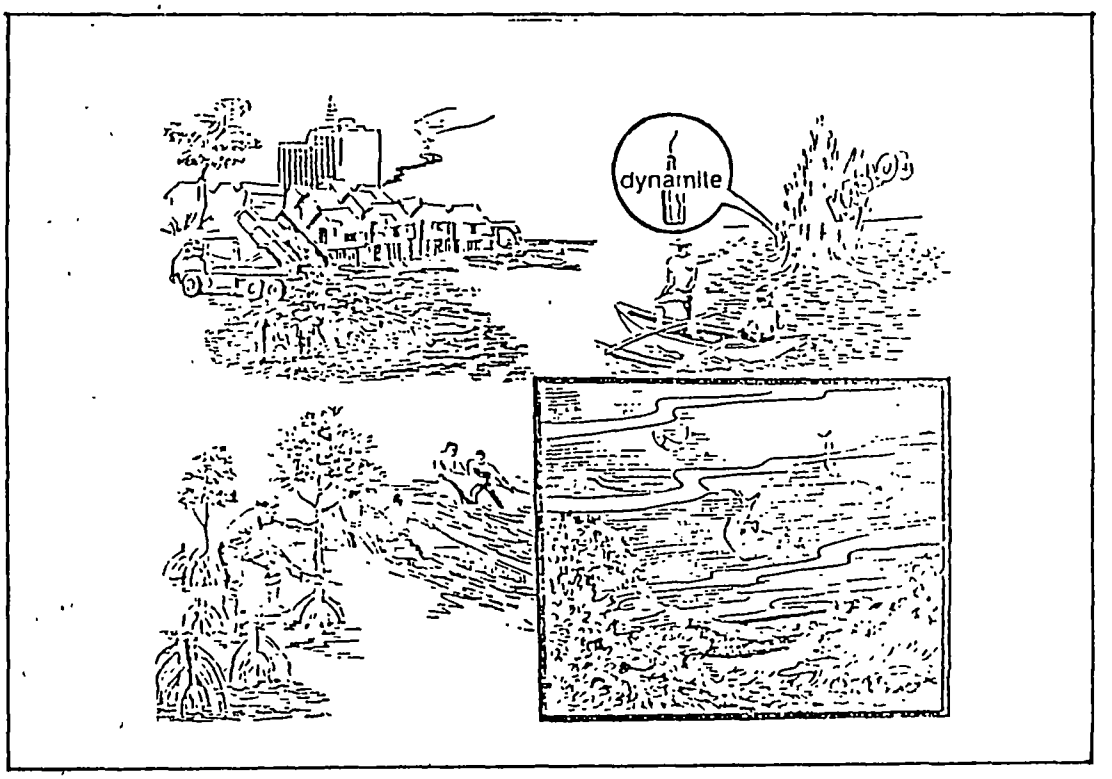


Figure 1. Map of Region 7 Showing CVRP-I Nearshore Fishery Pilot Sites

(1) Bohol - Northern
(2) Cebu - Southwestern
(3) Negros Oriental - Eastern
(4) Negros Oriental - Southwestern
(5) Siquijor - Entire

before CVRP



after CVRP

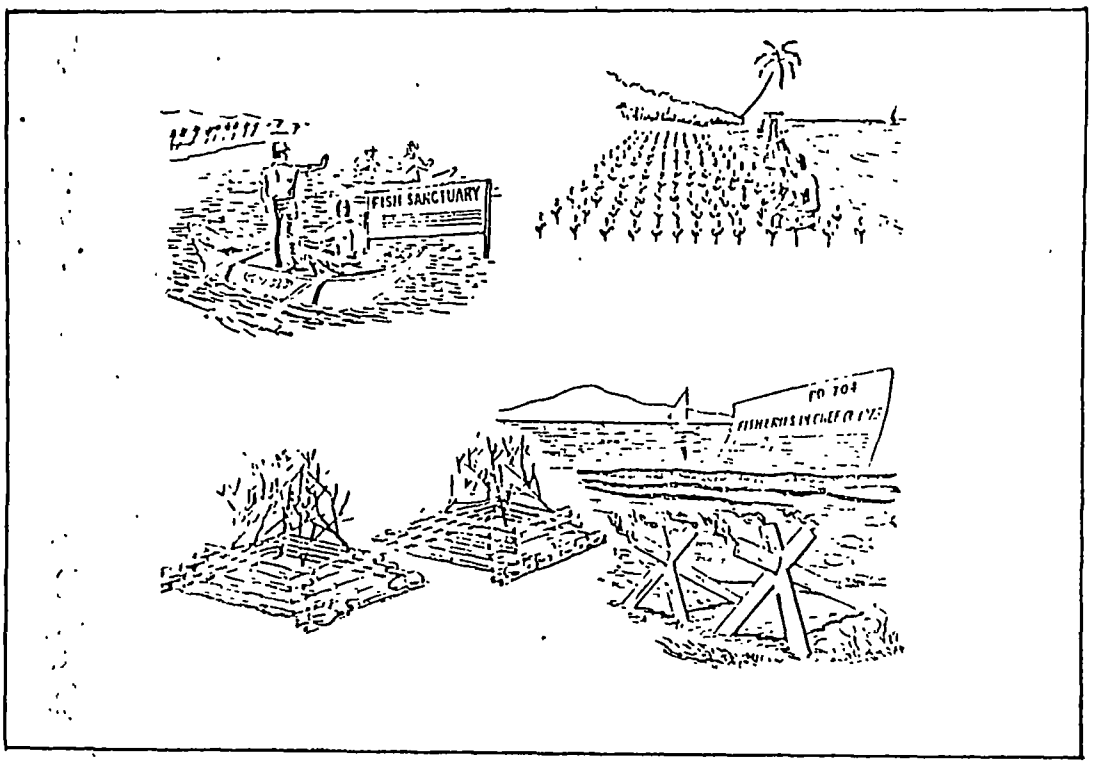


Figure 2. EXPECTED CHANGES IN RESOURCE USE INDUCED BY CVRP-I

Source: Handbook in the Teaching of Elementary Agriculture (Pursuant to DECS-MEC and CVRPs Philosophy, Concept and Technology), Gr. IV-VI Volumes. Published by CVRP-I.

Figure 3. NO. OF HH PARTICIPANTS
BY NSF INTERVENTION, BY SITE

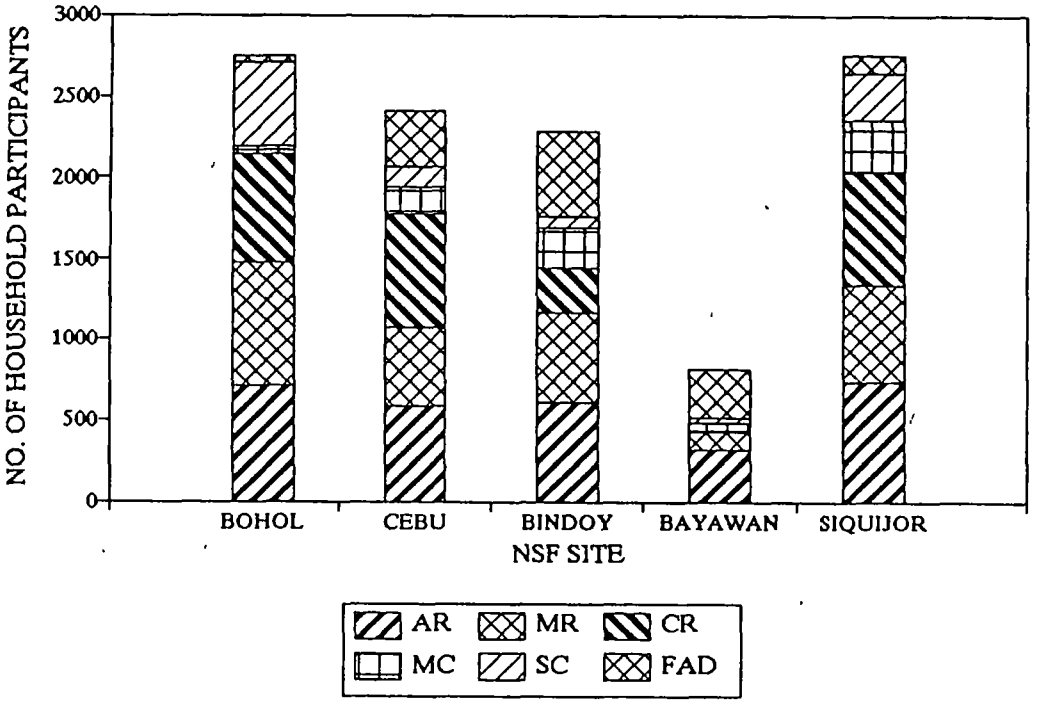


Figure 11. DISTRIBUTION OF HOUSEHOLDS
BY NO. OF INTERVENTIONS, BY SITE