CARIFICO: Indirect Input Challenges Towards Strengthening Fisher Cohesion During a FAD Co-management Project

CARIFICO: Desafíos Entrados Indirectos Hacia el Fortalecimiento de la Cohesión Fisher Durante el Proyecto de Gestión Conjunta de FAD

CARIFICO : Défiez d'Entrée Indirectes vers le Renforcement de la Cohésion de Pêcheur au Cours du Projet de Co-gestion des FAD

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ABSTRACT

The Fisheries industry provides employment and a valuable source of animal protein for consumption by Caribbean people. Co-management is considered an effective way of fisheries management and the social cohesion among fishers is identified as an important attribute contributing to the success of co-management. There are very few good examples of co-management in the Caribbean region and the question is how to strengthen the social cohesion. The Caribbean Fisheries Co-management (CARIFICO) Project is a collaborative initiative to develop suitable Fisheries Co-management approach(es) as pilot activities and to share these appropriately in the Caribbean region. CARIFICO is constructed on following two assumptions; indirect activities will promote trusting relationship among fishers and fishers organizations are strengthened and strengthened fishers organization will contribute Co-management activities. The project draws on experiences in Okinawa where it has been ascertained that social cohesion among fishers and their capacity for fisheries management are strengthened through economic activities within Fisheries Cooperatives. To validate the hypothetical model, a path analysis was designed using the information collected by questionnaire and interview with fishers. In the analysis, eight factors were identified as important. The results suggest that Legal and system supports by Fishery Departments as well as sense of solidarity significantly contribute to the formation of FAD groups. Noting that this analysis does not account for any indirect effects of factors which can influence the dependent variable, the assumptions made by the CARIFICO project were considered to be only partially verified.

KEY WORDS: Caribbean fisheries; co-management; FAD groups

INTRODUCTION

The Fisheries industry is important in the Caribbean economy. It provides employment and a valuable source of animal protein for consumption by Caribbean people. The Caribbean countries have Exclusive Economic Zones (EEZs) that are overlapping and share common interest in the sustainable management and development of fisheries resources. Therefore, sustainable use is essential at the national, regional and the Caribbean level on a whole. For resource management to be successful in the region, cooperation between government and communities at the local and regional levels must be developed and strengthened. Co-management is considered an effective way of fisheries management, and the social cohesion among fishers is identified as an important attribute contributing to the success of co-management. However, there are very few good examples of co-management in the Caribbean region and the question is how to strengthen the social cohesion.

The Caribbean Fisheries Co-management (CARIFICO) Project was launched in May 2013 for a five-year period and is a collaborative initiative between the Caribbean Regional Fisheries Mechanism (CRFM), the Japan International Cooperation Agency (JICA) and the Fisheries Divisions of Antigua & Barbuda, Dominica, Grenada, St. Kitts and Nevis, St. Lucia, and St. Vincent & the Grenadines (cf. CRFM 2013). The overall purpose of the project is to develop suitable Fisheries Co-management approach(es) as pilot activities and share these appropriately in the Caribbean region (cf. JICA and MAFFRD, 2013). It is envisaged that the project will adapt applicable co-management practices from Okinawa, Japan, to the collaborating CRFM Member States. Four project outputs are (after JICA and MAFFRD, 2013):

i) Consensus building on fishing rules around FADs and their maintenance,
ii) Licensing to FADs fisher participating co-management,
iii) Cost sharing for maintenance and replacement of the FADs, and
iv) Recording and reporting in the logbook.

It is thought that the FADs fishery can strengthen co-management regimes by shifting exploitation from often over-fished reef fisheries to the less heavily exploited offshore pelagic fishery resources. Traditionally, FADs were deployed by individuals or close-knit groups of fishers; recently however, governments have deployed public FADs accessible to all

(Sidman et al. 2014). In this instance, fishers share the same fishing gear (FADs) and fishing grounds, and hence cooperation is fostered naturally. In addition, the use of FADs is a fairly new fishing technology for the Caribbean region, and fishers do not exhibit traditional practices that would undermine new co-management rules. These are some of the reasons why CARIFICO selected the FADs for its pilot activity.

The project also draws on experiences in Okinawa, the southern island of Japan where the natural environment is similar to the Caribbean islands; and, where it has been ascertained that social cohesion among fishers and their capacity for fisheries management are strengthened through economic activities within Fisheries Cooperatives (Mikuni, Barnwell, Cruickshank-Howard, in press). Factors of relevance in this regard are:

i) Legal framework

Fisheries Law sets regulations for issuance of rights and licenses. The marine fisheries of Japan are classified under 3 distinct categories: fishing right fisheries, licensed fisheries, and free fisheries on the fisheries law.

Under the fishing rights pursuant to the fisheries law, the management for the coastal area is delegated to the FC and only members of FC have a right to operate fishing in the area in front of their fishing village

Unique factors to make Okinawa co-management work are as follows (cf. Mikuni, Barnwell, Cruickshank-Howard, in press):

a) Fisheries department support and supervise the FC.
- Separate law for FC from other types cooperatives
- Government support through subsidies
- Roles of the agent for the planning and implementation of the business of Fisheries Department
- Obligation of members to use the services

b) The member of the FC can enjoy various benefits such as fishing right and government support.

c) By Fisheries Law, only active fishers can be member of the FC. It increases the social cohesion of the members and their participation to the business and fisheries management of FC.

ii) Economic activities

Fisheries cooperative in Okinawa satisfy almost all needs of fishers (cf. Mikuni, Barnwell, Cruickshank-Howard, in press). This is a one-stop service and very convenient to the fisher. It also generates synergy effects among marketing, supplying and financing activities. The principle of the business of cooperatives is that the fishers are clients, shareholders, and also managers. It is the business of the fisher, by the fisher, for the fisher. The business concentrates on meeting needs which are not satisfied by private companies (to compete with private sector will be difficult.). To stabilize the revenue of the businesses, the fishers make agreement with FC to use the services provided by FC.

a) **Marketing** is the most important business in terms of fisher needs and revenue of FC, and FC will choose the marketing methods according to their capacity and market demand.

b) On the other hand, the profit of the **supply business** is relatively small, because the goods which fisher wants vary, no economies of scale, and there is competition with private shops.

c) Supply business. Proceeds from sale of fish are transferred to the fisher's account at FC bank and the fishers' receivables of supply business are automatically deducted. The fisher can borrow money for purchase of a fishing boat or engine without collateral, because FC knows his capacity for repayment and can directly collect payments from his proceeds.

In considering the Okinawa experience, CARIFICO has been conducting a variety of activities to promote Co-management (cf. Mikuni, Barnwell, Cruickshank-Howard, in press, see also Sidman et al. 2014). Those activities are classified into two types; *activities that directly support the Co-management*, and *activities that contribute to Co-management indirectly*.

Direct activities include consultation, data gathering information, issuing fisher IDs, formulation of fisheries management plan and so on. Indirect activities are to build a trusting relationship among fishers through collaborative work organized by CARIFICO. Those collaborative works include construction and deployment of FADs, maintenance of deployed FADs, introduction of new fishing techniques, construction of on board ice box, using fish landing facilities, and others. It was found in the Commonwealth of Dominica that many issues preventing optimal use of FADs stem from conflict between two fundamental requirements:

i) The desire for some level of exclusive use rights for fishers who (individually or collectively) invest in the deployment and maintenance of FADs, and

ii) The need to provide equitable access to the wild fisheries resources, which the FADs are designed to aggregate (Sidman et al. 2014).

In addition, it is thought that the opportunity exists to more deeply evaluate social conventions that characterize FAD governance arrangements as the basis for developing policy and management frameworks needs (*ibid*.).

It is presumed that the fishers who participated in the CARIFICO project realized the importance of fishers' organization and the relevant responsibilities. In other

words, CARIFICO is constructed on following two assumptions; indirect activities will promote trusting relationship among fishers and fishers organizations are strengthened and strengthened fishers organization will contribute Co-management activities (Figure 1). In this figure, activities in red letters are CARIFICO project activities.

METHODS

To validate the hypothetical model, a path analysis was designed (Udagawa 2014) using the information collected by questionnaire and interview with fishers. In the analysis, five major factors were identified that may affect the formation of functional fisher group. Those factors are; A (Profit), B (Solidarity), C (Leadership), D (Conveniences), and E (Shared issues). Another factor, F (Legal and system support) was also identified as important factor. Two other factors outside of CARIFICO activities that affect the fisher group were also identified as G (Social environment) and H (Support by Cooperative Division).

After pre-tests were conducted in St. Kitts and Nevis and St. Lucia, survey was conducted in three nations targeting local fishermen. As a result, a total of 127 completed survey questionnaires were collected: 34 completed questionnaires from St. Vincent and Grenadines, 29 from Grenada and 45 from Dominica through individual as well as group interview sessions; in addition to the three target countries, 11 questionnaires were collected from St. Kitts and Nevis, and eight were collected from St. Lucia, coming out of the pre-test.

RESULTS AND DISCUSSION

Since there were so many variables (77) and too few samples (127), Structure Equation Modeling (SEM) analysis was not possible (*ibid.*). Instead, multiple regression was used to analyze the relationship between the

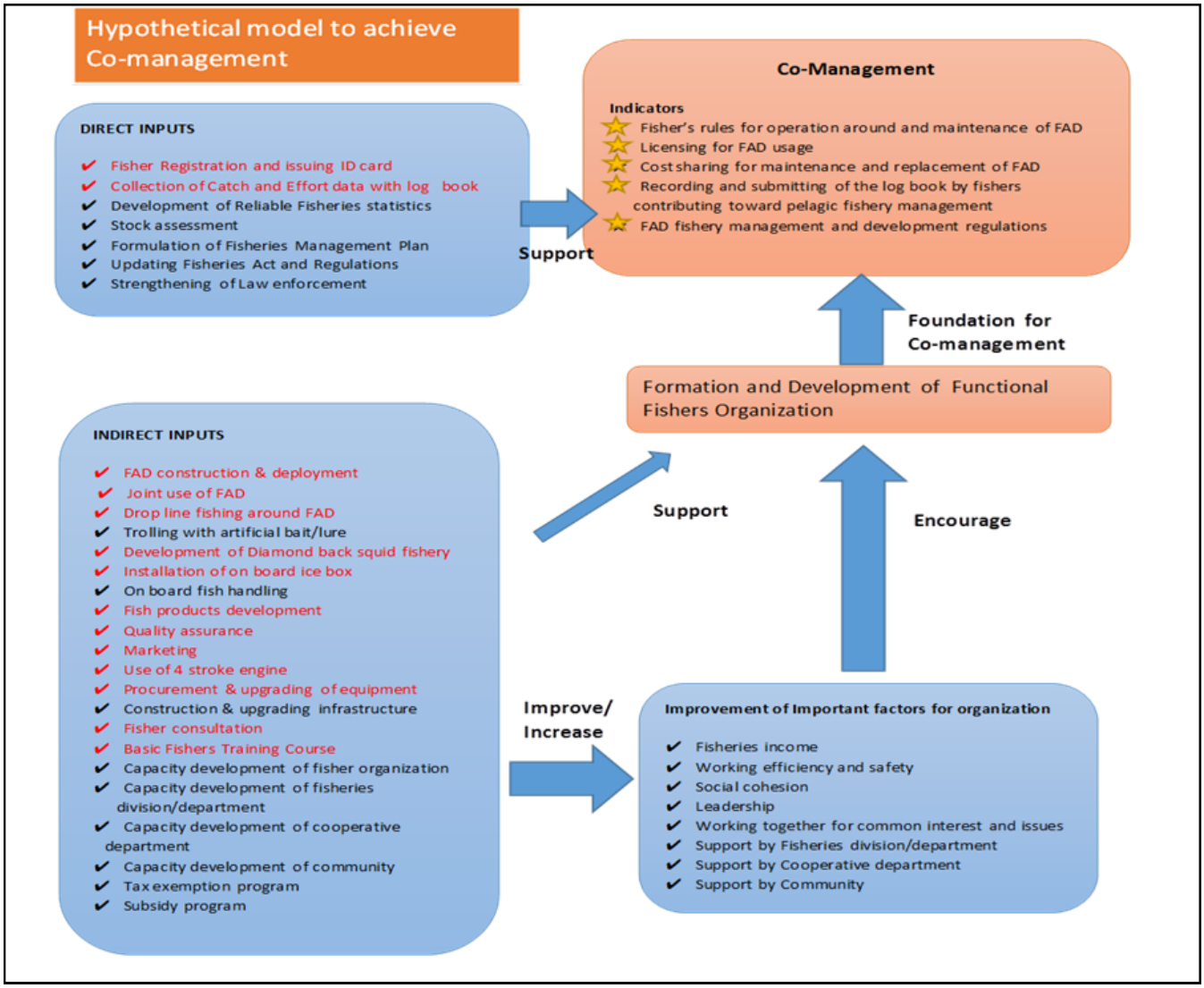

Figure 1. Hypothetical model to achieve Co-management.

Factors (A through H) and the dependent variable (Factor I). To run the multiple regression, responses of questionnaires were summed up by each factor (A through H) and used as the independent variable. As Factor I was the indicator for "formation or vitalization of functional FAD groups", the summation was considered as the dependent variable. All factors and some independent variables were used to estimate the coefficients (Table 1). Because of the empirical nature of the project and to mitigate the effects of multi-colinearity, the step-wise regression technique was used and the most parsimonious model was selected (*ibid.*) based on Akaike Information Criterion (AIC).

Table 2 shows the result of the most parsimonious multiple regression. Factor F (Legal and system support by Fisheries department) was significant at 1% level and Factor E (Share same issues/problems) was significant at 10% level (F-value of regression was 2.47 (significant at 5% and R-square was 0.122: Udagawa 2014). In other words, Legal and system supports by Fishery Departments significantly increase the formation of FAD groups at 1% level of significance.

Also, the sense of solidarity increases the formation of FAD groups at 5% level (F-value of the model is 9.02 (p = 0.000) and R-square is 0.162.). Share (Factor E) was significant for the full model, but it is not significant after excluding other variables. Consideration should be given to whether Share is correlated with other factors (*ibid.*).

It must be noted that this analysis does not account for any indirect effects of factors which can influence the dependent variable. SEM or other methodology can overcome the shortfall of this methodology (*ibid.*). With the small number of responses and many variables, it was not possible to run the SEM analysis. Given that many independent variables are correlated, it is always difficult; if not impossible, to understand the direct causal effects of each factor for any social studies

Since *Solidarity* speaks to the important indirect activities and *Legal and System Support* to direct activities supported by CARIFICO, the assumptions made by the CARIFICO project were considered to have been only partially verified. This notwithstanding, it is important to continuously monitor local fishermen to understand who are willing to form FAD groups whereas who are not willing to form FAD groups.

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Table 1. Multiple Regression Coefficient with all the factors (after Udagawa 2014).

Model	Unstandardized Coefficients		Standardized Coefficients	t	Significance
	B	Std. Error	Beta		
(Constant)	29.912	1.228		24.365	.000
Catches	9.13E-005	.006	.001	.014	.989
A Profit	-.166	1.010	-.018	-.165	.870
B Solidarity	1.792	1.096	.028	1.635	.106
C Trust	.820	.990	.098	.829	.409
D Convenience	.142	1.122	.013	.126	.900
E Share	1.878	1.077	.179	1.743	.085
F Legal	2.750	.958	.309	2.869	.005
G Socio	-.605	.955	-.072	-.634	.528
H Cooperative	-.987	.984	-.114	-1.003	.319

Table 2. Multiple Regression Coefficient with the most parsimonious model (after Udagawa 2014).

Model	Unstandardized Coefficients		Standardized Coefficients	t	Significance
	B	Std. Error	Beta		
(Constant)	30.000	.791		37.911	.000
F Legal	2.633	.873	.296	3.017	.003
B Solidarity	1.786	.846	.207	2.110	.038