

Use of the Results of Market Research for Co-Management of Fish Aggregating Device (FAD) Activities in the Commonwealth of Dominica

El Uso del Resultado de la Investigación de Mercado para la Co-gestión de las Actividades de Dispositivos Fish Agregación en la Mancomunidad de Dominica

Utilisation du Résultat de la Recherche de Marché pour la Co-gestion des Activités de L'appareil de Concentration du Poisson dans le Mancomunidad de Dominique

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ABSTRACT

Under co-management activity of Fish Aggregation Device (FAD), fishers organization seek to sell their catch faster, to provide fish that consumers like and to transport fish inland (areas that are difficult to get fish). A Total number of 411 interviews were conducted for fish market research in 2013 at fish landing sites, supermarkets, mobile vendors and inland areas. The purpose of the study is to understand the clarification of the consumer consciousness, depending on market or product and, or what important factor and activities influence the decision making process for consumers to purchase fish. These include place or product, service or price or promotion. The factor analysis and Covariance Structure Analysis were utilized.

In the study result, it showed that consumers are looking at "accessibility to fish as most important factor." The accessibility means not the distance from house or village, but the timing. They want the shop open when they visit, and there is always fish. Therefore, the supermarket like shop is their favorite.

So local fisher organization are using this result and now opening "fish outlet" in two inland sites. FAD co-management group decide to use frozen fish to supply these outlets. The organization is trying to purchase fish as much as possible from fishers who have FAD license, which National Association of Fisherfolk Cooperative (NAFCOOP) utilizes to enhance better quality of service for fishers purchasing FAD license as a part of conducting successful co-management related activities.

KEY WORDS: Market research, Fish Aggregation Device, co-management, Commonwealth of Dominica

INTRODUCTION

Fish Aggregating Devices (FAD) were first introduced to Dominican fishers in the late 1980s. Food and Agriculture Organization (FAO) Master Fisherman, Australian Richard Mounsey, under the Technical Cooperation with Developing Countries (TCDC) Fisheries programme, constructed and deployed the first deep water FAD one quarter nautical mile (nm) off the Marigot fish landing site on the Northeast (windward) coast of Dominica in 1987. This structure hastily disappeared. Further collaboration with the FAO resulted in the 1990 TCDC project which assigned Mr. Gisli Jonasson to the then Fisheries Development Division (FDD). Jonasson conducted work on in-shore (reef) FADs on the west (leeward) coast of Dominica. Very little data was collected during these experiments. One of the major challenges was the lack of support and collaboration from fishers at that time, fishermen displayed very little interest in this new fishing concept. (Personal communication with Fisheries Officer)

However in the late 1990s, Dominican fishers started being receptive to the idea of FAD technology. This interest was sparked by the persistent awareness drive of the Fisheries Division and the influences of foreign fishermen from the neighboring French territories of Guadeloupe to the north and Martinique to the south. Because of its geographic location between the two French territories, Dominica is left with a very narrow corridor for fishing outside of its twelve nautical mile territorial water limit. Catch landings of large migratory species have increased significantly since the emergence of FADs. Large pelagics, such as yellowfin tuna and Atlantic blue marlin along with small blackfin and skipjack tuna, comprise the highest percentage of Dominica's landed catch composition. Subsequently, FAD fishing has become very common and lucrative to fishers nationwide. However, this new technology resulted in numerous conflicts among fishers and other users of the Fishery Waters of Dominica. (Personal communication with Fisheries Officer).

Significant increases in landings of migratory pelagic species have been recorded since the upsurge in the use of fish aggregating devices (FAD's), which are widely used by fishermen to land large catches of migratory pelagic. Large aggregations of fishing boats are commonly seen associated with these structures along the coast of Dominica.

FAD fishing presents to fishers the benefit of fuel cost saving, increased probability of catching fish, and reduction in searching time for fish as compared to other methods of targeting the offshore pelagic species. These advantages to FAD fishing has spurred fishers and fisher groups to deploy FADs in areas that were traditionally known as migratory routes for pelagic species as well as areas with no traditional knowledge or observation of fish migration.

FADs are expensive to construct and deploy, and they can cost from about \$3,000 - \$7,000 depending the construction method, depth of water to be deployed, and the distance offshore to be deployed. Since most fishers are not committed to contributing financially to the construction and deployment of FADs the few who recognize the true value of the FAD tend to personalize the FADs that they set. Often, they try to set their FADs unknowing to others and at locations that are difficult to encounter without the GPS coordinates. It is of note that sailing distance between FADs are becoming less

dependent on logical and scientific reasons such as fish behavior, migration routes and distance from landing site. Rather distance was disturbingly being determined by the capability and ambition of fishermen to isolate themselves around their FAD.

Although FADs present a meaningful opportunity to diversify the fishery and increased landing of large pelagic species, it can be the root to major user conflict since individuals who invest in them want exclusive right to fish in the vicinity of the FAD (usually within one mile radius). Without the legal instrument that confers ownership of a deployed FAD, persons who deploy them without such right cannot exclusively own the fishery resources in its immediate vicinity. This then presents the perfect circumstance for conflict among the individuals wishing to fish around the FADs and those who incur the cost of their construction and deployment.

The high cost associated with FAD maintenance can be attributed to a multitude of factors including, strong ocean currents, rough sea conditions, rapidly alternating current direction, maritime traffic, vandalism, and an undulating sea bed structure. Such factors in association with increasing conflict, inadequate catch and effort data from the FAD fishery spurred developments toward regulating the activity. There are a few draft regulations in the draft fisheries regulation, however, there is need to update them taking into consideration the present situation and new management regimes.

Although the natural fisheries resources are owned by the state and there is a government agency responsible for its protection and management, it is felt that we must depend on the people who use the resource daily to make proper management decisions, hence the concept of co-management.

Efforts were made to develop a co-management approach to the FAD fishery involving the Fisheries Division and the National Association of Fisherfolk Cooperative (NAFCOOP). This process involved the conduct of national consultations with prominent FAD fishers and FAD fishing community groups, which identified the extent of the co-management framework.

However, while the draft regulation is under discussion by the government authority, fishers decided to provide better service to their members who purchase FAD licenses. Therefore, Fisheries Division and NAFCOOP are developing new market and planning to increase the storage capacity at Roseau Fish Market. To accomplish this goal, this market research was conducted during October to December 2013 and requested the increase cold storage capacity to the Japanese government.

Finally, the Dominica FAD group will increase capability of buying more “FAD fish” from members as a tool for better service for licensed FAD fishers and control free riders, who do not pay FAD license fees.

This survey is a part of the Caribbean Fisheries Co-Management (CARIFICO) Project which is sponsored by Japan International Cooperation Agency (JICA), 2013-2018. The purpose of CARIFICO project is to establish fisheries Co-Management examples in six Caribbean Countries. Outputs of the project will be shared among the Caribbean region. Under the project competent agency,

fishermen and fishing communities are expected to work together toward fisheries co-management. Fish Aggregating Device (FAD) fishery has been targeted for this case to increase participation of stakeholders and their capacity development.

Roseau City (Figure 1) has a Roseau Fisheries Complex, where Newtown Fish Market so called Roseau fish market, has industrial freezer and can stock FAD fish frozen and sell frozen fish fillet or sliced fish by handsaw for retail, the Roseau fish market sells fresh fish for retail customers and three major supermarkets, where consumers purchase for domestic consumption. In the landing areas, fishers sell fresh fish on the beach or along the street.

The Mahaut and Scotts Head communities sell fish more to their own villages. The Fond Cole landing site sell fish to villages and also to the customers passing by. Mobile vendors, who buy the fish at major landing sites and keep them in ice boxes and selling by driving pick-up trucks. Generally, the fish caught on the east coast is landed at Marigot Fishery Complex and transported to La Plaine or Roseau. Fish caught at Fond St. Jean, the south east end of Dominica is transported to Roseau and, on the way to Roseau, Mobile vendors sell it at Grand Bay. Grand Bay has only 83 households, has limitation to get fresh fish there and takes 30 minutes to closest landing site or 40 minutes to Roseau City. La Plaine has no landing site and consumers buy fish from mobile vendor or when they visit the city.

MATERIALS AND METHODS

Structural interviews were conducted at City center “Roseau”, landing sites “Fond Cole”, “Mahaut Village” and “Scotts Head”, and inland area “Grand Bay” and “La Plaine”. The market types were “Roseau fish market/vendor, supermarket, landing site and mobile vendor” during October to November 2013.



Figure 1. Dominica map.

Customer Survey on the Research and Development of “a model shop or outlet” was 54 questions were itemized and five-point method were used “1. I think so, 2. I think so, if anything, 3. No preference, 4. I do not think so, if anything, 5. I do not think so.” After review and receiving of authorization by the government of Dominica. Fisheries Division trained their data collectors of each district by using the enumerator manual, which standardized the interview quality. Total nine data collectors of Dominica Fishers Division were trained as interviewers. The structural interview were conducted in each survey site during October – December 2013.

Survey sights population and target household were shown that the interviewer has visited every house for this survey.

RESULTS

A total of 411 questionnaires were collected as total 14% of household (generally 10% - 24% rate except Grand Bay 89% house hold covered) (Table 1).

The result of cross analysis depended on interviewee living location showed next 4 points: Mahaut spends the most and Roseau and La Plaine spend less. Mahaut and Scotts Head consumers eat fish 4 - 5 times / week. Mahaut and Scotts Head consumer buy fish 4 - 5 times per week. 69% of consumer's like frozen fish and recognized as yesterday's catch quality.

Factor analysis shown in Tables 2, 3, 4 and 5, which data used for understanding the customer Liking or preference of each market and product type. IBM SPSS Statistics software (ver. 22) was used for factor analysis. Due to the exclude missing value, total data set, as number of valid response used were 376 of 411 interview. Factor extraction method was the principal factor method. Factor loading was 0.4 for rejection. Rotation method: Promax with Kaiser Normalization. 12 observed variables of market preference were analyzed by type of 4 fish market “Roseau fish market/ vendor, supermarket, landing site and mobile vendor.” Cronbach $\alpha = 0.6$ is used for rejection of the observed variance.

Table 2 shows the result of factor analysis and factor naming for Roseau Fish market/Vendor (n = 376). As the

Eigen values in reference, Four factors were extracted. Five values were referred for fish quality, so it's named “Factor 1 Fish Quality,” “Factor 2 Adequate presentation” was due to Employee attitude and fish presentation. “Factor 3 Accessibility to shop and good fish” was due to market and fish accessibility. “Factor 4 Environmental hygiene” was due to environmental hygiene and employee appearance.

Table 3 shows the result of factor analysis and factor naming for Landing site (Fond Cole, Mahaut villages and Scotts Head) (n = 376). As the Eigen values in reference, 3 factors were extracted. “Factor 1 Appropriate service” was due to the adequate environment such as employee appearance and its attitude, and/or fish presentation and price. “Factor 2 Accessibility” was due to access of market and fish. “Factor 3 Fish Quality” was due to fish freshness, taste and odor.

Table 4 shows the result of factor analysis and factor naming for supermarket (n = 376). As the Eigen values in reference, 3 factors were extracted. “Factor 1 Accessibility” was due to market and fish accessibility. “Factor 2 Shop appearance” was due to environmental hygiene, employee adequate appearance and adequate fish price. “Factor 3 Shop service” was due to employee attitude and fish presentation.

Table 5 shows the result of factor analysis and factor naming for mobile vendor (n = 376). As the Eigen values in reference, 3 factors were extracted. “Factor 1 Hygiene and appearance” was due to fish and environmental hygiene, employee adequate appearance, fish adequate presentation and adequate fish price. “Factor 2 was Fish Quality” was fish freshness, hygiene, good taste and good smell. “Factor 3 Accessibility” was due to market and fish accessibility.

The results of covariance structural analysis by using those factors in each market type were shown on the figure 2, 3, 4 and 5. The analysis was done by IBM AMOSS software (ver. 22).

Figure 2 shows the pass diagram for the Roseau fish market (n = 376). The observed variable “Fish Quality” is positively as pass coefficient 0.61 ($p < 0.05$) and “Environmental” negatively affected -0.12 ($p < 0.5$) toward Roseau fish market Liking.

Table 1. Number of interviewed and population data in each site.

	male	female	total	Number of households	Number of interview
TOTAL	35,931	34,808	70,739	26,085	–
Roseau city centre	7,121	7,685	14,806	757	74
Fond Cole	761	786	1,547	507	64
Mahaut Village /Belfast	1,082	1,031	2,113	785	75
Scotts head	341	368	709	283	67
Grand Bay	125	112	237	82	73
La Plaine	602	526	1,128	482	58
Sum	10,032	10,508	20,540	2,896	411

Table 2. The result of factor analysis and factor naming for Roseau Fish Market/Vender (n = 376).

Roseau Fish Market/Vender	factor and factor loadings			
Questions	1	2	3	4
Do you think that fish at ___ is fresh?	0.683			
Do you think that fish at ___ is hygienic?	0.721	Factor 1 Fish Quality		
Do you think that fish at ___ is tasty?	0.828			
Do you think that fish at ___ has good smell?	0.796			
Do you think that appearance of fish at ___ is acceptable?	0.690		Factor 2 Adequate presentation	
Do you think that employee attitude at ___ is adequate?		0.777		
Do you think that the presentation of fish at ___ is adequate?		0.735		
Do you think ___ is easy to visit to buy fish?			0.411	
Do you think ___ is open when you want to buy fish?	Factor 3 Accessibility to shop and good fish		0.743	
Do you think that fish at ___ is fresh?			0.555	
Do you think that environment at ___ is hygienic?				0.470
Do you think that employee appearance at ___ is adequate?	Factor 1 Environmental hygiene			0.538
	Cronbach α	0.880	0.736	0.604
			0.798	

Table 3. The result of factor analysis and factor naming for Landing site (Fond Cole, Mahaut villages and Scotts Head) (n = 376).

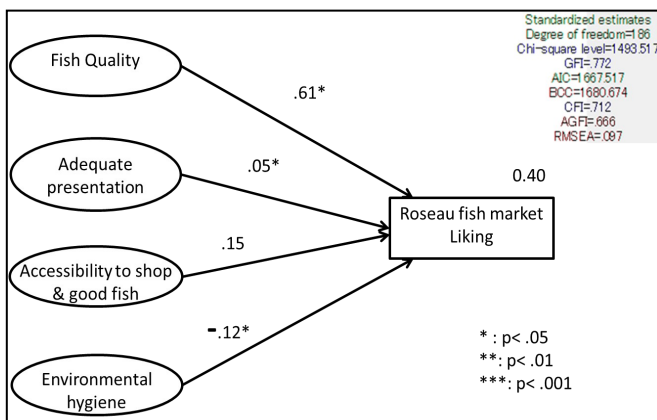
Landing site	factor and factor loadings			
Questions	1	2	3	4
Do you think that environment at ___ is hygienic?	0.633			
Do you think that employee appearance at ___ is adequate?	0.551	Factor 1 Appropriate service		
Do you think that employee attitude at ___ is adequate?	0.529			
Do you think that the presentation of fish at ___ is adequate?	0.740			
Do you think that fish price at ___ is affordable?	0.652			
Do you think ___ is easy to visit to buy fish?		0.923	Factor 2 Accessibility	
Do you think ___ is open when you want to buy fish?		0.638		
Do you think that fish at ___ is fresh?			0.498	
Do you think that fish at ___ is tasty?	Factor 3 Fish Quality		0.729	
Do you think that fish at ___ has good smell?			0.596	
Do you think that environment at ___ is hygienic?				0.801
	Cronbach α	0.748	0.737	0.655

Table 4. The result of factor analysis and factor naming for supermarket (n = 376).

Supermarket	factor and factor loadings			
Questions	1	2	3	4
Do you think ___ is easy to visit to buy fish?	0.743		Factor 1 Accessibility	
Do you think ___ is open when you want to buy fish?	0.840			
Do you think that environment at ___ is hygienic?		0.643	Factor 2 Shop Appearance	
Do you think that employee appearance at ___ is adequate?		0.840		
Do you think that fish price at ___ is affordable?		-0.568		
Do you think that employee attitude at ___ is adequate?			0.643	
Do you think that the presentation of fish at ___ is adequate?			0.835	
Do you think that fish at ___ is fresh?				0.737
Do you think that fish at ___ is tasty?	Factor 3 Shop service			0.577
Do you think that fish at ___ has good smell?				0.402
	Cronbach α	0.728	0.659	0.643
				0.560

Table 5. The result of factor analysis and factor naming for mobile vendor.

Mobile vender	factor and factor loadings			
Questions	1	2	3	4
Do you think that fish at ___ is hygienic?	0.479			
Do you think that environment at ___ is hygienic?	0.773			
Do you think that employee appearance at ___ is adequate?	0.839	Factor 1 Hygiene and appearance		
Do you think that the presentation of fish at ___ is adequate?	0.629			
Do you think that fish price at ___ is affordable?	0.535			
Do you think that fish at ___ is fresh?		0.719		
Do you think that fish at ___ is hygienic?		0.565	Factor 2 Fish Quality	
Do you think that fish at ___ is tasty?		0.791		
Do you think that fish at ___ has good smell?		0.872		
Do you think ___ is easy to visit to buy fish?			0.730	
Do you think ___ is open when you want to buy fish?	Factor 3 Accessibility		0.537	
Do you think that employee attitude at ___ is adequate?				0.560
Cronbach α	0.830	0.826	0.666	

**Figure 2.** Pass diagram for the Roseau fish market (n = 376).

However, it is significantly different between pass correlations of inland areas on Figure 3 and coastal areas on Figure 4. Figure 3 shows it sorted by interviewed in inland area “La Plane and Grand Bay” (n = 128), the observed variable “Adequate presentation” negatively affected as pass coefficient -0.19 ($p < 0.001$) and also “Environmental hygiene” 0.17 ($p < 0.001$) positive pass correlation toward Roseau fish market Liking, on the other hand Figure 4, its sorted by interviewed at landing site “Fond Cole, Mahaut village and Scotts Head” (n = 245), was observed variable “Adequate presentation” coefficient 0.15 ($p < 0.001$) and “Environmental hygiene” -0.12 ($p < 0.001$).

Figure 5 shows the pass diagram for the landing site (n = 376). The observed variable “Appropriate Service” was -0.22 ($p < 0.001$) negatively affect, on the other hand observed variables “Accessibility” 0.58 ($p < 0.001$) and “Fish Quality” 0.24 ($p < 0.001$) had positive pass correlations.

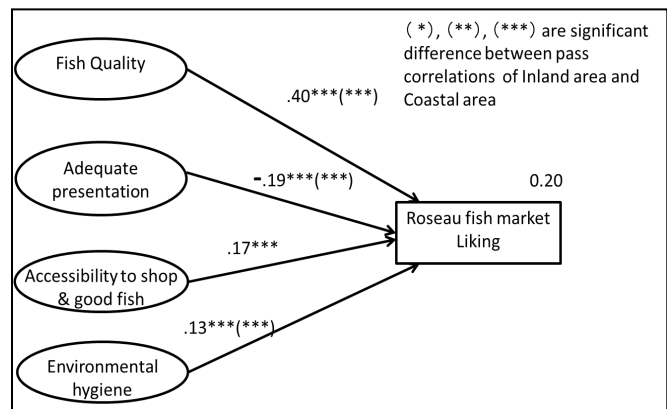
**Figure 3.** Pass diagram for the Roseau fish market sorted by inland area “La Plaine and Grand Bay” consumers (n = 128),

Figure 6 shows the pass diagram for the Supermarket (n = 376). The observed variable “Accessibility” 0.53 ($p < 0.001$) and “Shop Appearance” 0.17 ($p < 0.001$) were positive pass correlation toward the Supermarket Liking.

Figure 7 shows the pass diagram for the Mobile vendor (n = 376). The observed variable “Fish Quality” 0.52 ($p < 0.001$) and “Accessibility” 0.17 ($p < 0.001$) were positive pass correlation toward Mobile Vendor Liking.

DISCUSSION

From the results of cross analysis: Roseau city and La Plaine inland area could be a good target model for fish outlets site. Already, Mahaut consumers buy more fish per week and both landing site Mahaut and Scotts Head consume fish 4-5 times/week compared to Roseau city and La Plaine inland area. Also both landing sites Mahaut and Scotts Head buy more frequently as 4 - 5 times / week than Roseau city and inland La Plaine.

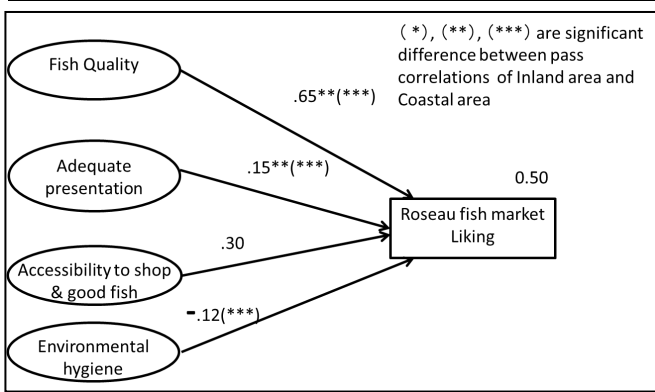


Figure 4. Pass diagram for the Roseau fish market sorted by landing area “Fond Cole, Mahaut village and Scotts Head” consumers (n = 245).

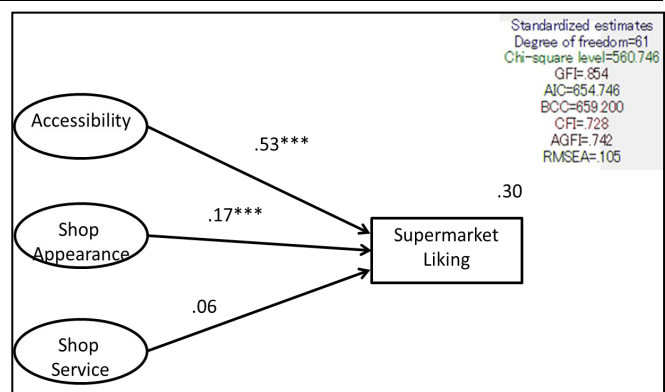


Figure 6. Pass diagram for the super market (n = 376).

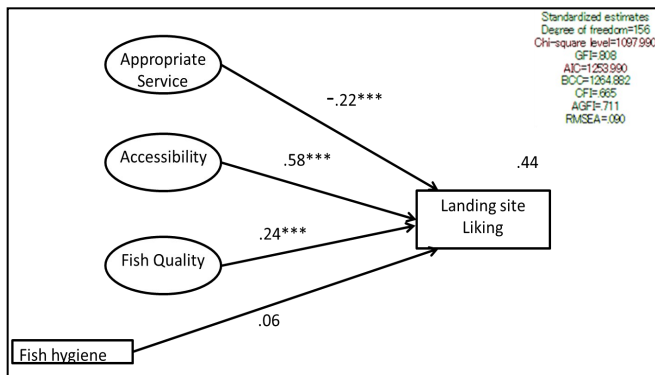


Figure 5. Pass diagram for the landing sites (n = 376).

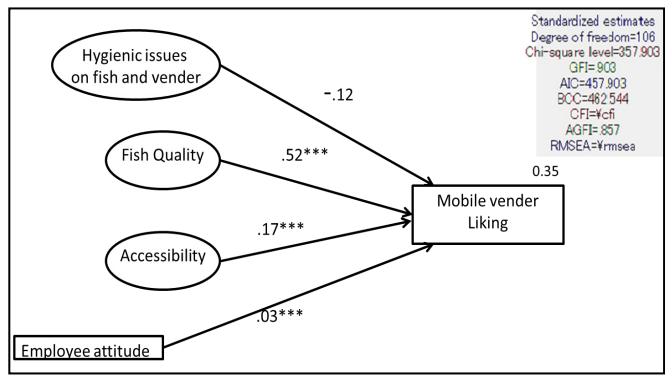


Figure 7. Pass diagram for the Mobile vendor (n = 376).

On the other hand, preference of frozen fish: 69% of consumer’s like frozen fish as much as yesterday’s catch. When the quality of fish is important, the providing frozen fish could be a better option for that consumer and also for marketing strategy. FAD catch generally was big size of yellowfin tuna and blue marlin in Dominica, therefore, sliced frozen fish is one of the option for increasing the capability of consumption efficiency and distribution expansion as it volume.

For the Roseau fish market Liking, consumers liked fish quality and adequate presentation, but against environmental issues. To improve the Roseau market Liking, the market should be cleaned up and employees should wear proper clothing. On the other hand, consumers living in inland areas (La Plaine and Grand Bay) like fish quality at Roseau fish market, accessibility to the market and quality of fish, however they do not like shop presentation. Vendor attitude and presentation of fish should be improved. Also, consumers living around landing area (Fond Cole, Mahaut village and Scotts head) does not like its environmental hygiene, therefore cleaning up the market and appropriate clothing of vendors should be improved for those customers.

For landing site Liking, consumers liked its accessibility and fish quality. The accessibility does not mean the distance to the market and its open when they like and

there are fish when they visit. However, consumers cannot receive appropriate service such as hygienic environment and employee and presentation of fish at landing area. If landing site make a small market improving those points, the consumer Liking will be improved dramatically.

For Supermarket Liking, consumers like accessibility as “easy to visit to buy fish” and “it is open when you want to buy fish”, and also shop appliance. The model shop should incorporate this ACCESSIBILITY into the strategy.

For Mobile Vendor Liking, consumer like fish quality, however they do not like hygienic issues on fish and vender.

CONCLUSION

The model shop “Fish Outlet” is adequate to open at Roseau and La Plaine, and even more to Grand Bay. The frozen slice fish of FAD catch is a product recommended to provide best service “Accessibility of fish” by this study. Therefore, the sliced frozen fish (small package) is appropriate product from consumer and supplier point of view (always found at model shop “ACCESSIBILITY” and clean package “HYGIENIC and GOOD QUALITY”). To do it so, catch of the day fish around FAD received from fishers should be frozen by industrial freezers and packed as optimum quality at Roseau Newtown Fish Market. This is recommended product for model shop. The

frozen packaged fish has the advantage because of its cleanness, and there are no issues for environmental hygiene. Model shop employees or owners should keep clean market and best attitude for customers for marketing strategy to improve Liking to satisfy consumer needs.

Especially in the case of Roseau City, there are two choices. One is to open new model shops in the city and another is to improve environmental hygiene at Roseau Fish Market and add the frozen package product.

Increasing the marketing of fish caught around FADs will provide the capacity and efficiency of purchasing the fish from fishers by the Roseau Newtown market. This is an option for NAFSCOOP to provide the best service to its members, and those who purchase FAD license fees as a part of the FAD co-management.

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