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Preliminary Impact Assessment of Seaweed Cultivation by the Coastal Communities in Sabah, Malaysia

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ABSTRACT

Seaweed is found in abundance and grows naturally in the east coast of Sabah. The local communities traditionally plant seaweed as part of their socio-economic activities. During the 10th Malaysia Plan or RMK-10 (2010-2015), this long endowed economic activity was identified to have a high yield potential and thereafter, was promoted as one of the most promising sectors in the National Key Economic Areas (NKEA) under the Entry Point Project (EPP 3). Substantial seaweed funding allocations were given to several agencies and thereafter, seaweed farming was promoted with a two-pronged strategy: to increase the national income and to improve the socio-economic conditions of the local communities. This research was aimed at looking at the impact of seaweed industries among the coastal communities, with a case study in Semporna, Sabah. The methods used were mostly qualitative, with data being collected through interviews, field observations, questionnaire forms and secondary references. The survey results showed that four systems are being used by the state to implement the seaweed industry. Each system has its own weaknesses and strengths, and has had a different impact on the economy of the state as well as on the local communities. The efficiency of each system was compared and evaluated. The lessons learned should be useful in enhancing the visibility of the seaweed industry in Malaysia.

Introduction of Seaweed in Malaysian

In an effort to spur the country's economic growth, the government has introduced several economic development programs under the Economic Transformation Program (ETP). This program is aimed at converting Malaysia into a high-income nation by 2020, with an estimated increase in the per capita income from US$ 6700 in 2009 to US$ 15,000. In order to achieve this target, a yearly economic growth of about 6% is needed. The Economic Transformation Program identified 131 projects and over 60 business ventures for promotion and implementation during the 10th Malaysia Development Plan or RMK-10 (2010-2015). One such business venture is the seaweed industry which, when fully operational, should be able to generate annual revenue of about RM 130 million. Subsequently, the Sabah Department of Fisheries was charged with the implementation of this project. One of the areas identified for the large-scale production of seaweed was Semporna, Sabah, partly because seaweed is

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already the main source of income for the coastal communities, and partly due to the conducive local environment, where the seaweed is growing in its natural state.

Geographically, most of the seaweed producing areas also falls within the Coral Triangle Initiative (CTI) region, an area with a rich marine biodiversity covering parts of Malaysia, Indonesia and the Philippines. On-going conservation studies in the CTI also recognise the seaweed and marine-dependent communities as being part of the unique components of the CTI region. On the Malaysian side, the Department of Fisheries is constantly monitoring the overall fishing industry and is also working closely with the coastal communities. When the CTI was introduced as part of the discussions during the United Nations Climate Change Conference (UNCCC) in December 2007, the member countries also addressed conservation and development potentials. On the Malaysian side, the Sabah Fisheries Department highlighted that the seaweed industry is a unique component of the CTI that must be addressed along with other concerns.

Materials and Methods

The Coral Triangle in Malaysia, Indonesia and the Philippines is the supplier of 80% of the overall seaweed products in the world (EU & Indian Ocean Commission Report, 2012). The seaweed industry in the region is growing rapidly with support from the public and private sectors (ETP Review, 2012). In the course of developing and increasing the productivity of seaweed, each agency is free to initiate and devise methods of cultivation, production and marketing. This, in turn, has created variations in the implementation and output of the seaweed industry in Sabah. Quite often, the local communities have become part of these new methods and are often subject to the vulnerability of the state's success and failure.

Study reported in this paper was carried out for understanding the planning and implementation of seaweed programs and impact of seaweed industries on local communities. The methods used for this study were mostly qualitative. The data collection was done through observations, secondary research and semi-structured interviews with leading agencies, participating communities and officers from the Fisheries Department. The fieldwork was conducted at several islands and involved interaction with the communities involved in Tun Sakaran Marine Parks, especially in Selakan, Sebangkat and Omadal Island. Several communities at Bum-Bum Island, where the seaweed industry is being promoted through the "cluster scheme" under the direct supervision of the Sabah Department of Fisheries, were interviewed. Another method was through focus group interviews with the communities participating in the program under the Ministry of Rural Development. The data obtained from the implementing agencies were useful for understanding the modus operandi of the state, while the data from the communities were necessary for gauging the impact of the seaweed project on the local communities.

Results and Discussion

The main findings could be grouped into three categories, namely: a) lead agencies, b) implementation strategies, and c) issues and challenges. The data on seaweed production were useful for measuring the success and output of each strategy. The following sections provide an account of these findings.

Main Agencies Involved

Three main agencies are involved in the planning and financing of seaweed production in Malaysia. The first is through the People's Development Program under the Ministry of Rural and Regional Development (KPLB). The aim is to encourage fishermen to be involved in seaweed projects to supplement their income from the diminishing fishing industry in the hope of improving their socio-economic conditions. The second agency that is involved is the Fisheries Development Authority of Malaysia, which has about 750 acres of seaweed farms in Semporna, and 3,000 acres under joint partnership and association with the Department of Fisheries, Sabah. The third agency is the Department of Fisheries, Sabah. Several other sub-agencies under different ministries are mainly involved in participatory researches and experiments with seaweed handling and processing gadgets and how local communities react to new technology. For example, SIRIM is involved with an experiment on the best method for fastening seaweed seedlings onto main anchors; Universiti Malaysia Sabah is studying new methods of management through a seaweed mini estate project; and Universiti Kebangsaan Malaysia is involved with seaweed drying technology.

Seaweed Implementation Strategy

Four strategies are being used for the implementation of seaweed project in Semporna. Each strategy has been implemented with a different local community. The strategies and agencies involved are: a) The Farmers Association, with funding from the Malaysian Ministry of Agriculture and Agro-Based Industries, based on a cluster strategy; b) The Sabah Fisheries Department with a cluster and mini estate strategy; c) Universiti Malaysia Sabah with a mini estate system; and d) the traditional culturing strategy implemented mainly by independent members of coastal communities. From the statistics and observations, the strategy by the Farmers Association seems to be the most successful among the four strategies.

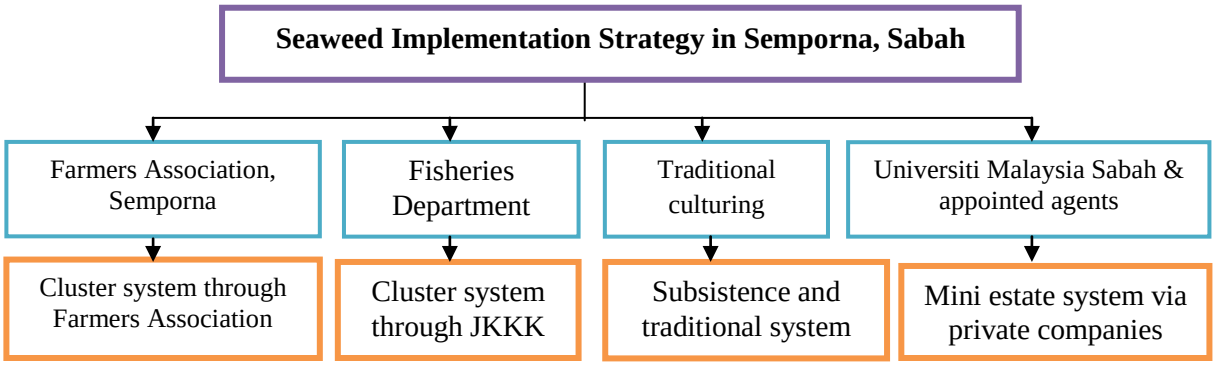

Figure 1. Four Types of Seaweed Production Systems in Semporna, Sabah.

Issues and Challenges

The findings showed that the State agencies involved in the seaweed project have implemented several different strategies and that each strategy has had its own issues and challenges. The brief discussions in the following section provide insights on these findings.

Issues and challenges from the perspective of lead agencies

Overall, the seaweed implementation strategies have been mostly top-down, with minor inputs from the local communities. One of the main challenges has been to find suitable sites so that the conditions in the productive seaweed culture plots are conducive to growth and output but are not in conflict with the overall goals and objectives of the Coral Triangle Initiative (CTI). Unfortunately, most of the productive areas are also home to a rich marine biodiversity. The Sabah Park is an agency entrusted with the conservation and protection of a gazetted area in the Tun Mustapha Marine Park. The seaweed has found its way into several pockets of traditionally-owned seaweed farming areas. Although they have been allowed to breed seaweed in areas reserved by the Sabah Parks, the parties responsible for managing seaweed farming, in particular the Department of Fisheries, are still constrained, especially to meet the production target. Currently, the exact mechanism for balancing conservation and production initiatives is not clear and is subject to vulnerability and uncertainty on both sides.

Perhaps one of the main constraints facing the seaweed mini estate system is the tenure system, where by law, agencies and agents involved are required to hold the land titles in order to secure funding and loans from financial institutions. Under the Sabah Parks and State laws, no land title shall be issued for areas gazetted as conservation sites. This particular conflict of the land ownership problem, i.e. between the State, the UMS, as the leader of the Mini Estate Project, and the appointed agents, is now causing delays. This issue has arisen because under the existing procedures established by the Performance Management and Delivery Unit (PEMANDU), approvals or land titles are needed before any financial allocation can be channelled to the implementing agents. The research finding also showed that this should not have been a problem as it could have been addressed in the Seaweed

Estate System Agreement (Japson Wong Woo Ren, research officer of the mini estate system, March 10, 2014).

Issues and Challenges from Local Communities (Table 1)

i. Motivation issue among farmers

One significant issue was the acceptance among different groups in the communities, including the youths. For example, the pilot project for the Mini Estate System on Selakan Island, initially targeted the youth group, which was given the training, paid working days, seed funding, management manual and equipment. In short, this youth group was trained and prepared to take up the seaweed estate project. After one year, Universiti Malaysia Sabah handed over this initial project to the youth group of Selakan Island. Unfortunately, the youth group was more interested in becoming wage earners instead of project owners (Mispal Ali, 2011). Most were not committed to the work schedule and were not interested in accepting responsibility for the implementation and management of the project. When the initial project was about to be completed, many of the youths expressed their wish not to own but to continue working as wage earners under the project.

ii. Issue of foreign workers

According to data from the Department of Statistics, Malaysia (2010), the total population in the Semporna District is 133,164 people, out of which 36.4% are non-citizens. Apart from the official statistics, the undocumented population is unknown. Fieldwork conducted on the islands of Sebangkat and Silungun revealed that a substantial number of seasonal, undocumented workers from a nearby country are working in the seaweed industry. This has given rise to significant social and security issues in the area, forcing the government to take several measures, including the setting-up of the Eastern Sabah Security Command (ESSCOM) with regular patrols by the armed forces to discourage and remove undocumented migrants. The unintended consequence of this has been a drastic loss in the number of labourers working in the seaweed projects. The net result has been a decline in seaweed production (Nur Shahrizal, March 11, 2014).

iii. Issues with plantation plots and output

Each of the four projects are facing similar issues regarding price control, where the farmers are not able to set their own pricing and are very much dependent on middlemen. At the same time, the price for seaweed seedlings is increasing, resulting in a high cost of production.

iv. Issues with natural predators

All the cultured seaweed plots are subject to natural predators, particularly sea turtles, fishes and marine mammals. Other issues are parasitic algae, *Enteromorpha, Ulva, Chaetomorpha, Hypnea* and *Hydroclathus*, that threaten the growth of seaweed (Michel De San, 2012).

v. Issues with new technology

Local communities are slowly adapting to new technologies such as methods of cultivation, equipment and marketing. This new learning curve has resulted in a temporary slowdown in terms of production and efficiency.

vi. Issues of understanding local conditions

Perhaps one of the main issues underestimated by the seaweed industry has been the adoption and understanding of local conditions (Japson Ren Wong Woo, 2014). For example, seaweed farming is influenced by local weather patterns and wind conditions. Based on the local knowledge of the ethnic Bajau Laut, the wind blowing from the south will move in around February to April, while the wind from the north will move in around September to December each year. This wind direction determines the effect of the seaweed culturing process in terms of seed selection, and the use of technology, such as the length of the rope and appropriate culturing time.

Table 1. Issues Concerning Seaweed Plantations in Semporna, Sabah

ISSUES/PROBLEMS/CHALLENGES	DESCRIPTION
Plantation Plots/Output	a) Absence of price control b) Rising prices of seeds c) Natural predators d) Culturing area (Ownership Status of Land) e) Lack of perfect breeding centre
New Technology	a) Difficult to apply the concept of using new technology to the participants
Market Issues	a) Dependence on the price of the manufacturer and independent agents from outside b) Price dependence on the quality
Understanding Local Conditions	a) Ice-ice disease b) Wind and weather effects c) Threat of parasites such as algae, wild weeds d) Threats from turtles (*Black hole*), small fishes, *Belawis* e) Problems with garbage, cleanliness and depth of sea water

Source: Unstructured interviews on Selakan Island and Silungun Island, November 2014

Based on local wind patterns, the Bajau Laut people have observed and experienced that seaweed production in Silungun Island is more vulnerable to the southern wind. This can be avoided by selecting a shorter fastening rope (as in the Eco Friendly Tie-Tie Rope technique) of 50 meters instead

of 100 meters, which is more suitable for the Bum-Bum and Selakan Islands. When winds come in from the northern region, this will benefit seaweed farming in the Merotai and Tawau areas. The strong winds from the south can cause the seaweed seedlings to be disconnected from the main rope, but the slower winds from the north can increase the fertility of the seaweed.

During the rainy season, the colour of the seaweed will turn green, while during the south wind, the seaweed will turn red, purple or green. The seaweed variety known as the "*Tambalang"*, the local name given by the Bajau community, will turn yellow when dried, but will turn brown or black during the rainy season. This knowledge is very important because the colour of the seaweed will determine its market value (Sabah Fisheries Department, 2009).

Thus, understanding the local conditions and receiving guidance from the knowledge of the local community are pertinent to the health of seaweed farming. Unfortunately, most seaweed project managers do not understand or refuse to acknowledge local conditions and, thereafter, labourers are forced to follow a predefined management and implementation strategy. The net impact of not following the local knowledge, on the one hand, is that the local community is discouraged, and on the other hand, the seaweed output is reduced (Sabah Fisheries Department, 2012).

Conclusion

The seaweed rural transformation development in Malaysia appears to be fragmented, excessively project-oriented and not adapted to local conditions. Implementing agencies are lacking in intra- and inter-agency coordination. Data and knowledge are not being shared among seaweed project players. This was evident through interviews with the State project management team members. The Cluster Project, under the Farmers Association of Semporna, appears to be the most successful among the four projects. Part of its success is attributed to the fact that the team members are from the local communities and possess local knowledge, are internally motivated and are receptive to new methods for an orderly and systematic seaweed farming system.

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