**Title: Restoration Channel and Waterfront Community by Effective Utilization of Local Biomass and Bio-waste Resources under the Concept of "the Most Beautiful Village in Japan": A Case Study of Tan Phu Thanh Village, Hau Giang Province in Mekong Delta, Vietnam**

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**Abstract:**

This paper aims to be described the key concept of Vietnam – Japan collaborative project to restore a waterfront village as "the most beautiful village" in Mekong Delta, Vietnam. In order to achieve this purpose, our collaborative team set on a case study about community-based action in Tan Phu Thanh Village, Hau Giang Province. For revitalization a waterfront concept, our team tried to give new life to old water channel as a symbol of new waterfront community, where has become old-fashioned and obsolete. To restore a diverse waterfront landscape, first of all, an obstacle and garbage in a water channel must be removed.

In this paper, the local biomass utilization and bio-waste recycle will be discussed for channel restoration and its effect to develop a waterfront community. Can Tho University had been done some projects in a village on biogas installation and production from local biomass and bio-waste materials since 1996. In Tan Phu Thanh village, 10 biogas digesters were already installed at household level. Based on this experience, local people in Than Phu Thanh village can easily and efficiently convert local biomass and bio-wastes into effective resources (thermal energy and organic manure) by themselves in daily life.

To scale up from household level to community level, integrated community center (Organic aquaculture, Organic vegetable, Organic husbandry, Flower-bonsai garden, Fish sanctuary, Wastewater treatment, Organic fruit garden, Traditional medicine garden, Eco-tourism station) has been designed in Tan Phu Thanh village.

In Vietnam, the New Rural Village policy has been carrying out since 2010 at the national level. Many villages have reached the criteria such as infrastructure, planning, irrigation, and so on. However, the criteria of the environment and beauty-village are difficult to be reached. The most beautiful villages in Japan (2005-) have been set up 27 criteria, which is integrated elements of community initiative, agricultural landscape, renewable energy, food production, community-based tourism, consensus building. It is necessary to set up and propose the

criteria of the most beautiful villages suitable in Vietnamese conditions based on this case study.

Keywords: Waterfront community, Restoration, Bio-waste, Local Biomass, New Rural Village, the Most Beautiful Village, Mekong Delta, Vietnam

## 1. Introduction

In Mekong Delta, holistic and integrated water channel system had been constructed during the French colonial period. However, from 1990s, since the roadway network had been expanded, ship transportation completed its role and the water channel and waterfront community became obsolete in a Mekong Delta. Originally, Mekong Delta has been developed a rich bio-diversity and various types of Agro - Aqua eco system of land use for a long time. The characteristics of the land are flexible or resilient, made by the dynamic flux and reflux of a Mekong river. This project aims to create diverse types of tropical agri - aquacultural land use based on the beautiful water cannel system and water front villages.

The New Rural Village policy in Vietnam has been carrying out since 2010. Many villages had reached its criteria such as infrastructure, planning, irrigation, and so on. However, the criteria of income, environment, and beauty-village are difficult to be reached. How can we enhance to achieve these criteria by community power? How can we support to master the form of the beauty and environmental-friendly village?

In this paper, it will be discussed with the first step to “the most beautiful village” is removing dirty and soiled things radically all over the village. Therefore, our team focus on integrated approach more than 20 years practical experience of bio-waste recycle and its utilization with community people (mainly Can Tho University). As a specific issue, we will try to scale up the biogas and waste-biomass and local biomass recycling system from farmers household levels to community levels and build a community - energy - tourism centre as the heart (symbol) of the most beautiful village.

This project has been accepted by the TOYOTA Foundation International Grant Program 2019, as a part of “Sustainable Agriculture of Rural Area in Mekong Delta, Vietnam and Mountainous Area, Japan by Community-based Action for Effective Utilization of Bio-wastes Resources”.

## 2. Study Area

The project site is Tan Thanh Tay hamlet, Tan Phu Thanh village, Chau Thanh A district, Hau Giang province in Mekong Delta, Vietnam (Figure1). Why this site was selected to our model project? 1) Good soil quality (alluvial soil) suitable for plant and agricultural production, 2) Good water quality (fresh water for whole year round): affected semi-diurnal tidal regime. No deep flooding seldom happens, 3) Infrastructure inside the village is already improved due to New Rural Village development, 4) There are plentiful natural resources, especially green biomass. In general, physical environment is suitable for agricultural production, 5) Social respect, 80% farmers have their own agricultural land, average area of agricultural land is 0.5 ha/household. 75% of local people has lower-high school level. Average income is ca. 1.670 USD/person/year (The report of the Village People Committee in 2017)

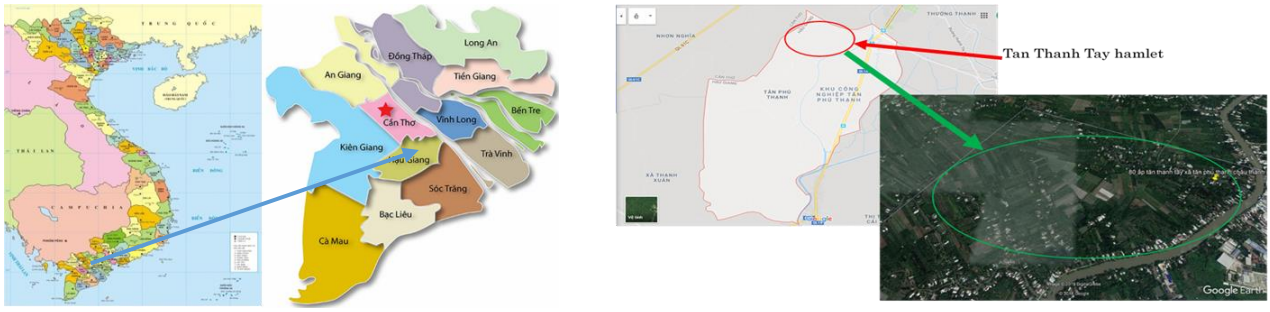


Figure1. Tan Thanh Tay hamlet (Mekong Delta, Vietnam)

## 3. Approach and methods

### Concept Design:

The main approach and methods is the designing and its construction of water front market and food processing factory by using generating electricity from community biogas. Can Tho University did install some projects on biogas production from local biomass and bio-waste since 1996. Our team has experts on biogas installation and production for also training for trainers, and network of smart farmers has been established for several villages in Mekong Delta by the JIRCAS and DANIDA project. Our team already installed 10 biogas digesters as a VAC (fruit garden- fish pond- livestock) system for the community in the Tan Phu Thanh village. In this project, we are designing Community Biogas Centre with food processing factory trying to scale up from household level to Community Biogas level.

This centre is the heart of advanced New Rural Village towards the most beautiful village in Mekong Delta. This centre makes the network powerful within farmers and producers, and make regional circulation; composting, soil improvement, organic agriculture and aquaculture, community based eco-tourism inside the village (Figure 2)

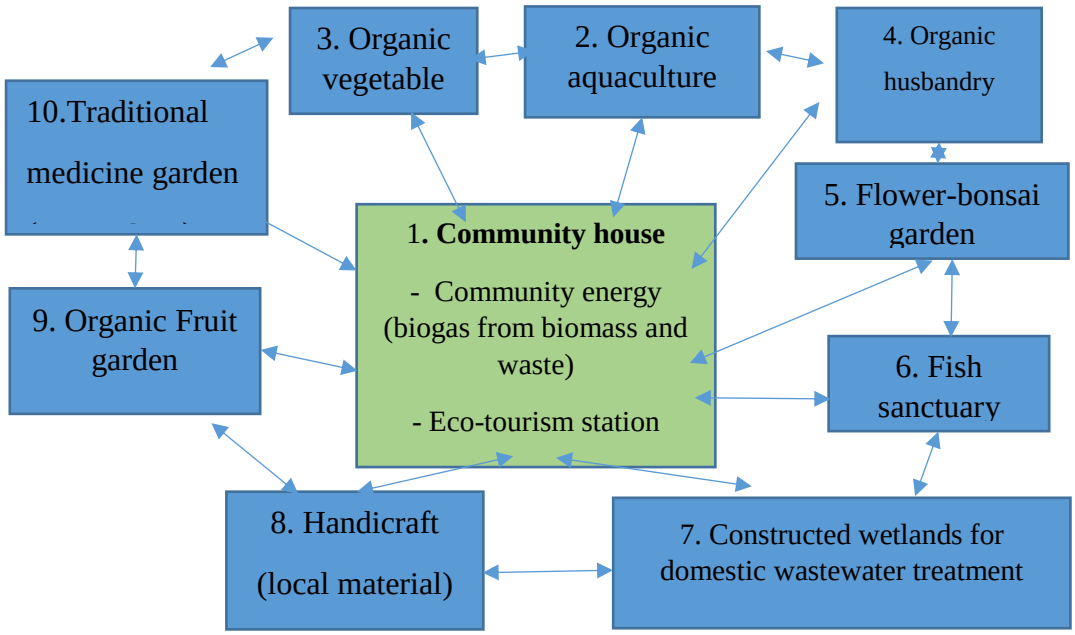


Figure 2. Concept Design of Community Biogas Centre

**Coordination and consensus building with Stakeholders in the village** :

Using PRA (Participatory Rural Assessment) tool to build consensus. Stakeholders are classified. Each stakeholder will vote leader. And then establishing the project management board (PMB) consist of the leader of stakeholders and local government. The PMP and our team will response on project activities planning, implementation, monitoring and assessment. PMB organizes meeting, workshop, study tour exchange, video clip training materials.

**Role of Village Women:**

Traditional society in Vietnam, women have a important roles in taking care family and selfdom and less attending social activities. Nowadays, their roles have been improved. They play more important roles in production and society. Many smart women are voted for governmental leader. For instance, head of this village is also woman. Women assigned leadership roles and having economic opportunities identified and helped. The key persons in village activities are representative people who are leaders of stakeholders voted.

## 4. Project Activities and Key persons inside the village

**Community Biogas House (CBH):**

Nowadays, most of villages have information house which have been established by local government. Contribution is from the local government; therefore, community feel the house is un-friendly because purposes of the meeting house are only for introducing policy and law of government.

To have a place for displacing local traditional products, solving conflicts within community. The community biogas house (CBH) that is contributed by community themselves. They feel proud and take care by themselves. CBH is a common site for farmers meeting. Additionally, the CBH is also for training and exchange the knowledge within the community, students, and other communities who visit this place. The important purpose of the CBH is also as an eco-tourism.

The CBH is managed by about 10 households including of the farmer donate their land for building the CBH. 10 households who live around the CBH. The leader of this group will be selected by themselves and recognized by the local government.

Collecting biomass for biogas digester is in-turned within 10 households. Each household will response on operation (collect material, take care on the CH activities. Income from the CBH activities will be shared within them.

Eco-tourism will be established after finishing the all above components. This is kind of community eco-tourism. Visitors will learn community activities: sightseeing, enjoy local organic foods, practical lessons on livelihoods, enjoy harmony life, local culture.

Our team will organize a consensus meeting between local government, community and Can Tho university to select a suitable site for building the CBH. Land is contributed by famers without financial charge. Material to build house is collected in the community and is paid

with low cost. Material are mainly wood instead of concrete construction. The total of house area is about 200 $m^2$.

Figure 3 shows green biomass materials and the installed biogas digester at household level. Green biomass biogas digester (GBBD) will be installed nearby the CBH. Total volume of GBBD is about 50 to 100 $m^3$. Material for the biogas digester is mainly water hyacinth and agricultural waste or by-product. The biogas digester material is high density polyethylene (HDPE). Gas from biogas digester is used for making traditional cakes (rice paper, sticky rice, ….), electricity generator. The local clinic (local medicine and sauna room) will be established within the CBH. Some simple fevers of the community and visitors will be cured at this clinic.


**Figure 3. Green Biomass and Biogas Digester (household scale)**

**Organic Aquaculture integrated with constructed wetland:**
Organic aquaculture is focus on the local fish such as climbing perch, gourami, local carp, tilapia, snail. For fingerling: Our team train farmers how to breed the fishes. The fingerling will be fed by algae which is grown by effluent of biogas digester. Fingerling will sell for commercial raising. Tilapia fingerling will be used for raising snakehead fish, elephant ear fish.

Raising local snail: Local snail is well-known in the rural area by special local protein for consumption. The price is high. It can have to increase income of farmers. The feed for local snail is *Pistia*. sp. Our team will use the effluent of the BD to plant the *Pistia* sp. The *Pistia*

sp. seem to be a bio-filter because the *Pistia* sp. absorb N and P which are abundant in the effluent. The *Pistia* sp. grows well in the pond contains the effluent outlet. Pista biomass is also used as input material of the BD.

**Organic Vegetable:**
Organic vegetable (OV) is planted with biogas effluent, rice husk biochar after adsorbed nutrient in the effluent. By-product of agriculture will be used to produce compost. OV will be consumed by community, gradually expand to market. CTU trains a group of farmers who try to plant OV.

**Organic Husbandry:**
Organic Husbandry (OH) is raised with households who have available pig cages. Feed are supplied from OH by-product, fermented rice which is made at CBH for using biogas. Pig meat will be provided for the community. Plan of pig will be raising, and pig slaughter will be announced to community. Pig dung will be inputted into the biogas digester.

**Flower Bonsai Garden:**
Use land around the CBH (ca. 05ha) to plant flower and bonsai. When visitors will come to the CBH, they will see and take photo with beautiful flower and bonsai. Building beautiful road landscape: grow plant and flower along the road side.

**Fish Sanctuary:**
Along with the main channel, our team will use bamboo materials to the frames. Inside the frames, our team will plant water hyacinth. Water hyacinth will be an input material for the community biogas digester, feed for pig. Besides, these frames will protect erosion of river banks. These frames will be habitats for aquatic animals (fish, shrimp).

**Constructed Wetlands for Domestic Wastewater Treatment:**
Our team selected a low-lying area of the village to build up constructed wetland. Area is about 2,000$m^2$, is constructed a full-dyke system to avoid leakage of waste. Local aquatic plants will be planted in the wetland. They will utilize for biogas input materials or Sauna. Garbage and wastewater of households will separate into organic waste and in-organic. Organic waste will be put in biogas digester. The remain will discharge into constructed wetland for treatment.

**Handicraft:**
Our team will select a group of farmers who have kind of skills on handicraft making. Handicraft could be coconut or bamboo baskets, clay soil cooker, water hyacinth mat. Our team will invite trainers from another places to train. The products will be displaced and sell at the CBH for visitors.

**Organic Fruit Garden:**

Tan Thanh Tay hamlet is a famous place for fruit trees. However, most of them planted with chemical fertilizers. Our team select a organic garden that have currently fruit trees and we train farmers transfer from chemical fertilizer technique to organic technique. So that, our team will use biochar after adsorbed nutrient combine with compost to supply for soil. Our team also apply to save the irrigation inside the village by pipe system. Our team will promote to limit in using chemical resources. Our team try to apply IPM in control the pest such as using yellow ant to protect the insect.

**Medicine Garden (Sauna / Clinic):**
Our team will select experienced old farmers who have indigenous knowledge on using local plants for health care. They will be trained traditional health care. Select a suitable place in the community, not far away from CBH for planting. Processed medicine will be done and used within the community. These medicines will be pre-treated simple ways before use and sold with low price for visitors or free for the poor residents. Some special medical species will be used for sauna too.

## 5. Policy Impact Design

**Vietnam Government Resolution No. 120 and Decision No. 417:**

In the most recent years, Vietnam National Government declared the resolution No. 120 (Nov/2017) and decision No.417 (Apr/2019) on sustainable and climate-resilient development of the Mekong Delta Region. From now on, this area will be developed rapidly led by the national initiative and international investments. Based on official resolution 26-NQ/TW of 7th executive board of the central party of Vietnam tenure X, resolution 24/2008/NQ-CP of the Prime Minister about the Executive program of carrying the resolution 26-NQ/TW, guidance on: "Agriculture, farmers and rural has the important roles for industrialization, modernization, construction and national security, and are the basics for sustainable social-economic development, political secure, insurance of national defence, maintenance and development of the people, cultural characteristics and ecological and environmental protection of Vietnam. Farmers are the main subject of the development; re-construction of the new rural villages are the basics of whole development, modernization and industrialization".

**New Rural Village policy:**

Building New Rural Villages to improve the material and spiritual life of the people; have appropriate socio-economic infrastructure; suitable economic structure and forms of production organization, associating agricultural development with industry and services; associating rural development with urban areas; democratic, equal, stable and rich national cultural rural society; ecological environment is protected; defence and security, order maintained.

By 2020, the number of village reaching new rural standards will reach 50% (of which, the target of each region is: Northern mountainous region: 28.0%; Red River Delta: 80%; North Central Vietnam : 59%; South Central Coast: 60%; Central Highlands 43%; Southeast: 80%; Mekong River Delta: 51%); Encouragement of each province and city reaches governmental level to try to have at least 01 district meeting new rural standards;

On average, the whole country will achieve 15 criteria / village (of which, striving goals of each region is: Northern mountainous region: 13.8; Red River Delta: 18.0; North Central: 16.5; South Central Coast: 16.5; Central Highlands: 15.2; Southeast: 17.5; Mekong River Delta: 16.6); The whole country has no villages under 5 criteria.

Basically, completion of the essential works will be achieved to meet the requirements of production development and life of rural residents: transportation, electricity, clean water supply, schools, commune health stations. Improve the quality of life of rural residents; create many production models associated with stable jobs for people, income increased at least 1.8 times compared to 2015.

**The Most Beautiful Village in the Mekong Delta, Vietnam:**

Based on this practical experiment on a model village, we will propose the index of revised new rural village policy, it means that we will make new index and criteria of "the most beautiful village in Mekong Delta".

The definition and concept design of "the most beautiful village" in Mekong Delta shows below (Figure 4):

1) Landscape should be harmonized between nature and artificial: river, canal, settlement pattern. Traditional culture such as settlement, cuisine, local festival is maintained at the most beautiful quality.

2) Organic based on agri - aquacultural production; Closed production activities through linkage between agronomy-animal husbandry-aquaculture for environment friendly and to preserve biodiversity, to restore the water front community.

3) Using local material, bio-waste, green biomass to produce renewable energy oriented to self-supply energy for the community by themselves.

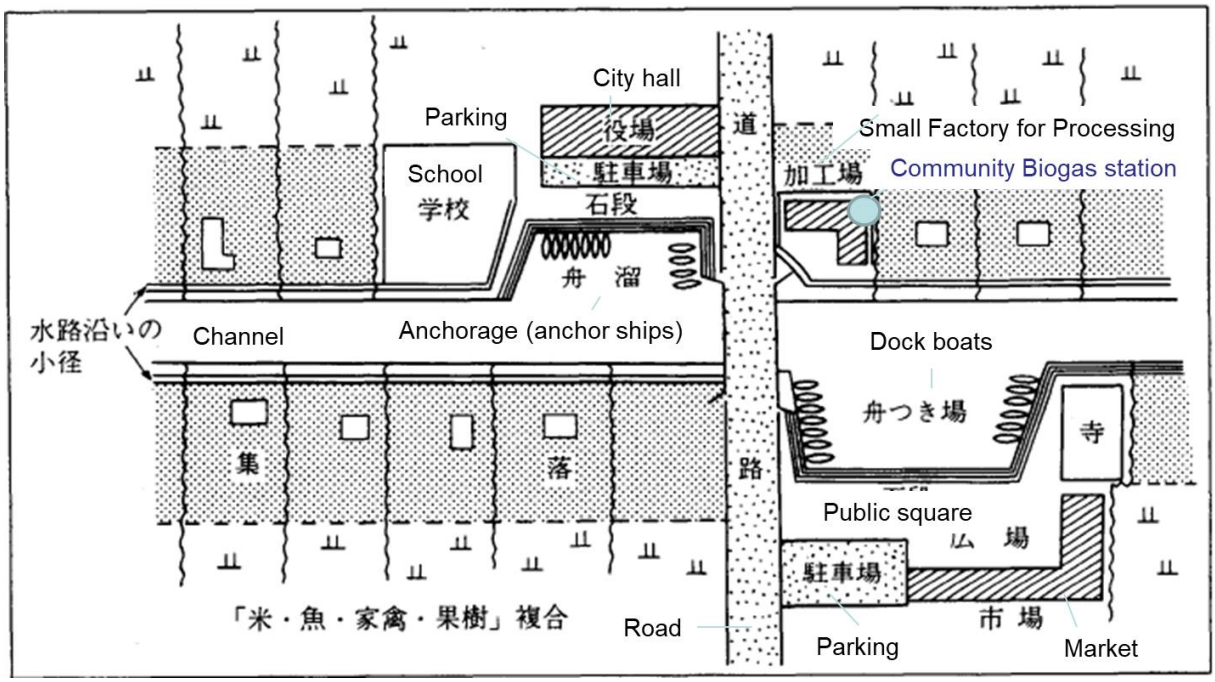


**Figure 5. The Most Beautiful Village in the Mekong Delta (water front community)**

## 6. Conclusion and Recommendations

This project is an aim to change the policies of rural planning and natural resource management based on the approach of bottom-up (to establish new criteria of the most beautiful village, based on current criteria of New Rural Village). This is a new idea for the villages in Vietnam. Therefore, the remainder of a case study in Tan Phu Thanh villages and as well other communities in Mekong Delta will be identified for scaling-up in both community biogas system and community - energy - tourism centre under the new concept of "the Most Beautiful Village in Mekong Delta".

This idea is supported by Rector of Can Tho University and People Committee of Hau Giang province. The tentative project period is 5-10 years. A middle-range vision is implementation of both community biogas and community - energy - tourism centre under the new concept of "the Most Beautiful Village in Mekong Delta" all over the Mekong Delta (including Cambodia area) for the future.

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