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A SPARK IGNITED BY KAVALAN CULTURE AND SATOYAMA-SATOUMI PARTNERSHIP IN TAIWAN

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ABSTRACT

Xinshe Tribe, located in Fengbin Township on Taiwan's east coast, is the largest gathering place of the Kavalan people in the world. The "Eight Fools Organic Farming Areas" initiated by the Xinshe Tribal Development Association, under the guidance of the Hualien District Agricultural Research and Extension Station (HDARES), Council of Agriculture started to recover the terraces planting scene. The use of pesticides and fertilizers in mountain areas will affect marine organisms. Therefore, the Xinshe tribe also participated in the first Tribal Self-Monitoring Coral Reef Ecological Plan in Taiwan to protect their ocean. By using the knowledge of ecosystem services to solve the pest problems, and using the rotation technique which the villagers learned from HDARES. They also built up multi-function ecological ponds establishment to purify their food wastes and reuse the nutrient in food wastes to fertilize the hydroponic vegetables. "Farming" is an important part of their tribal culture and it needs to be passed on to the next generation through actual actions. Therefore, the Eight Fool Organic Farming Areas are also open to students of the Xinshe Elementary School for field class, so those students can participate in the process of rice growth. The result seems to be successful, but success is contributed by the guidance of the HDARES and the persistence of tribe people to achieve their goal of planting delicious rice in their own land.

Keywords: Xinshe tribe, Eight Fools Organic Farming Areas, ecosystem services

INTRODUCTION

Xinshe Tribe, located in Fengbin Township on Taiwan's east coast, is the largest gathering place of the Kavalan people in the world. Xinshe in Kavalan language is "Paterongan," and it means "the land that nurtures all creatures." It has the largest sea-facing terraces in Taiwan, close to the Pacific Ocean, which provides moisture for the land making it suitable for planting. The tribe is also the exit of the stream from the coastal mountains to the sea, where a crop has been grown there continually for a century. For the Kavalan tribe people residing in the area, rice harvesting has been their livelihood for a generation, which is why they have already developed a strong affinity and affection for rice.

People of the Xinshe tribe started to collaborate with the HDARES since 2013, and it became the first experimental field in Taiwan which was built with the habitat of rice pests' natural enemies. Before HDARES joined, Ms. Li-Yun Gong, Chairman of the Xinshe Tribe Development Association, started to cultivate the hillside land left by the elders all by herself. She devoted herself not only in the promotion of the Kavalan Culture throughout the "Paterongan Flying Fish Working Group," and the Xinshe Tribe Development Association, but also participated in organic farming in the field.

However, as the young people of the tribe leave to work in the urban city, the population continues to age, and more and more fields lie to be fallowed, it is gradually difficult to see the scene of the harvest of terraces. The "Eight Fools Organic Farming Areas" initiated by the Xinshe Tribal Development Association, under the technological guidance of the Hualien District Agricultural Research and Extension Station (HDARES), started to recover the terraces planting scene (Fig. 1). They not only succeeded in planting delicious rice on their tribal terraces but also led the Xinshe tribe to the development of organic agriculture and Satoyama settlement.

They start to formally sell their rice in Hualien Farmer's Association's Supermarket, Tian Pu Market, and Tungtaman Night Market (former Ziqiang Night Market). (Sun *et al.*, 2018)



Fig. 1. Organizers of the Eight Fools organic farming areas.

ECOLOGICAL POWER OF ORGANIC FARMING

The Eight Fools organic test field, which cooperates with the HDARES, has been fully rested and has accumulated organic matter for many years because of fallow cultivation, which is suitable for organic cultivation. After HDARES Counselling Team conducted a soil test analysis, the team recommended Ms. Gong to sow the seeds of Taikeng No. 2, a rice variety that is not only suited to the Hualien region but is also delicious and resistant to numerous pests and diseases. They use rice bran for weeding and the materials of Integrated Pest Management for pests' control. Also, HDARES introduced the first technique of ridge vegetation in Taiwan, planting native plants on the ridges to create habitats for parasitoid wasps, ladybugs, and long-legged spiders, to eat the pests in the field by planting various native flowers and plants on the fields to create a variety of habitats and increase the number of parasitoid wasp, carnivorous ladybugs and long-jawed orb weavers, which are the natural enemies of many rice pests in the field. "Agriculture is the root of everything." The organic farming can not only create income for the tribe, but also has been considered as an important part of maintaining ecology.

Although the original Kavalan people didn't fish for their livelihood before they migrate to Xinshe village, they learned fishing since they lived there. All tribe people get together and go fishing at night during the free time of the farming season. This has become a unique characteristic of the Kavalan culture. However, a few years ago, local people found that the

marine organisms were affected by the use of pesticides and fertilizers in the mountain areas. Since they transformed their cultivation from conventional to organic, one of the farmer, Pan Yinhua, found out that marine ecology seemed to be better than before. He was wondering whether the agricultural management is related to the marine environment or not.

Therefore, the Xinshe tribe participated in the first Tribal Self-Monitoring Coral Reef Ecological Plan in Taiwan (Fig. 2). Under the guidance of Dr. Chaolun Allen Chen, a coral researcher of the Academia Sinica, the tribe's ecological rehabilitation started from the mountain streams, directed the water to the water terraces, and then used the biological absorption to digest the organic matter before entering the sea to reduce pollution from the land. To maintain such environmental conditions, the necessary factors for terrace farming include the use and cultivation of non-pesticides and non-chemical fertilizers, and the reduction of any external disturbances.



Fig. 2. The tribal self-monitoring coral reef ecological plan in Xinshe tribe.

“Take care of the mountains so the oceans will be healthy” this adage has been deeply planted in Xinshe tribe people’s mind, and become a common understanding among them, but there is still much technical things that need to be improved.

LEARNING FIELD MANAGEMENT FROM HDARES

Although the Kavalan people have been growing rice for more than 100 years, some agricultural technologies have been lost. Young people have to learn from the beginning, and many professional knowledge and technologies have been taught by HDARES.

Biological control-natural enemies

In the case of pests and diseases, the tribe farmers will search for help from the responsible unit of the HDARES, and HDARES' staff will take care of their farmers almost on an individual "one-on-one" mode. In general, planting rice requires a large growing area and monocropping. This typically leads to low biodiversity and a high risk of pests and diseases.

To resolve these problems, the HDARES modified the international ecosystem services concept to include ecological engineering methods appropriate for Taiwan. As part of this modified approach, flowering plants that do not belong to the *Poaceae* family such as Tropic Ageratum (*Ageratum houstonianum*) which were found beside paddy field will not be removed. French marigold (*Tagetes patula*), a plant under the *Asteraceae* family characterized by its long flowering period and high number of flowers, were planted to provide nectars for ladybugs and parasitoid wasps, which are natural enemies of pests like moths, planthoppers, and leafhoppers.

The counselling team also performed an insect count in Xinshe region. According to the results, for the organic paddy fields that adopted a ridge vegetation method, 13.3 parasitoid wasps on average were captured, more than the 10.5 on average counted in conventional paddy fields; the number of ladybugs captured was also higher than conventional farming fields. Furthermore, comparing the number of planthoppers in the organic field to that in the conventional field produced a ratio of 23 to 100, indicating that there were nearly five times less planthoppers in the organic paddy fields.

Paddy field pests, such as planthoppers, leafhoppers, and snout moths, can be effectively prevented and controlled by their natural predators, such as ladybugs and parasitoid wasps. These effective pest killers can be retained by constructing an eco-friendly environment and minimizing the need of pesticides. The retention of pests' natural predators and growing of flowering plants in ridges are new methods that challenge traditional ideas, which emphasizes the removal of weeds in ridges, to consider replacing the practice of monocropping with biodiversity to prevent and control pests and disease as well as enrich the agricultural ecosystem.

Planting techniques

The spacing between each row of rice was increased to facilitate ventilation. In addition, the amount of nitrogen fertilizer was controlled to prevent the rice tissues from becoming overly soft and susceptible to pests and diseases. An innovation weeding method called “rice bran weeding” was introduced, along with integrated pest and disease prevention and control materials. The rice bran weeding method involves placing one ton of rice bran in each hectare of farmland after rice seedlings have been transplanted. The heat and acid released when the rice bran contacts with irrigated water inhibit weed germination.

Because rice bran contains a substantial amount of organic matter, it has enough abundant nitrogen that only a below-average amount of nitrogen fertilizer is required. On average, the use of one ton of rice bran can reduce the use of nitrogen fertilizers by 30 kilograms. Other than preventing and killing weeds and being capable of use as an organic fertilizer, rice bran also reduces the amount of fertilizer necessary during the initial stage of organic rice planting. The effectiveness of rice bran as a means of weed control, has been observed and it was noted that when rice bran is used, weeding was not even necessary throughout the entire rice-period.

Rotation techniques

Unlike the symbiotic cultivation of crops in Yilan, the “Eight Fools Organic Farming Areas” is using the rotation technique which the villagers learned from HDARES to rotate rice with soybeans (*Glycine max*), black beans (*Phaseolus vulgaris*) and Tartary buckwheat (*Fagopyrum tataricum*) (Fig. 3). The advantage of rotation is that because of the different crops’ root depth, the inorganic elements absorbed proportion, and the biota in the soil are different, rotation can promote the balanced use of soil nutrients, especially the rotation of paddy fields (rice) and upland crops (beans). It can improve soil aeration, reduce the accumulation of harmful substances, change the soil ecological environment, increase fertility, and make field management much more convenient.



Fig. 3. Rotation technique in Xinshe Tribe.

Multi-function ecological ponds establishment

Based on the concept of biodiversity, farmers built two small ponds inside the paddy fields. Ms. Gong grows five aquatic plants in the ponds, water spinach, lotus, lotus flowers, rice, and water bamboo. The plants do more than beautify the paddy fields, as they can also purify the water. Ponds filled with flowing water have the ability to purify water, thus the two ponds enable double-layered purification. For example, when soup is poured into the pond, the fat in it is broken down and absorbed by the plants, and the rest of the soup becomes purified water.

The effectiveness of this method is evident from looking at the lotus flowers and water spinach in the pond, which have grown beautifully despite never having been fertilized. Small pieces of food pour into the pond are devoured by apple snails. Because of this purification process, wastes are cleared and the land and water remain uncontaminated.

Professional knowledge training course

According to the needs of the tribe, the HDARES also opens a variety of courses such as grains and vegetable cultivation classes, rice experimental field practices, and the recommended use of environmentally friendly materials as well as the provision of additional technical assistance.

Each of the partners of the "Eight Fools Organic Farming Areas" has their main business, and they need new blood to join and assist in their fieldwork. Therefore, the professional knowledge and technologies which the HDARES have provided developed abilities for those new farmers to fight against various natural disasters, and to have more confidence in farming.

MAIN IDEA OF ECOLOGICAL SUSTAINABILITY: LOHAS PHILOSOPHY

LOHAS means “Lifestyles of Health and Sustainability,” which is the goal of Kavalan people’s farming philosophy. To achieve that, they needed stable water supply to support the farming job. In order to improve the long-term instability of the farmland's water supply, the HDARES helped to seek funding and project from the Irrigation and Engineering Department to assist in the repair of the tribal waterway. After their water supply was stable, added with the successful disease control, the original yield was around 3600 kg of rice per hectare has been upgraded to around 4800 kg per hectare in 2018. However, due to the basic cost of organic farming which is very high, especially the post-harvest preservation, they are still not able to produce enough yield or income to support their work.

There is another tribe near Xinshe tribe, which is an Amis’ tribe near Xinshe tribe, called Fuxing tribe. People of these two tribes share the natural resources together but have totally different cultures. Fuxing tribe also has an aging population and weak livelihoods problems. The HDARES found that it is not enough for them to strengthen their rural life only by HDARES. They need more assistance from other organizations. Thus, the HDARES cooperated with the College of Environmental Studies, National Dong Hwa University to invite the Xinshe tribe, the Fuxing tribe, Forestry Bureau Hualien Forest District Office, and the Hualien Branch of the Soil and Water Conservation Bureau to form the “Forest-River-Village-Ocean” Ecological Agriculture Initiative Platform (Fig. 4). All stakeholders involved in the platform and work together will make a great positive impact on the tribes. Because of the establishment of this platform, the HDARES not only introduced various agricultural resources but also made Xinshe tribe more famous.



Fig. 4. “Forest-River-Village-Ocean” ecological agriculture initiative platform meeting.

Yet, organic farming is beneficial to ecological sustainability, which is the common goal of their tribe. Therefore, although the Xinshe tribe has beautiful terraces and seascapes, and they are promoting eco-tourism. The tribe people also have a common understanding that they are not in a hurry to earn sightseeing wealth, but their goal is to develop organic agriculture in the local area, to make all the necessary "construction" which can help the tribal ecology and culture. Only by properly and correctly using the land can they retain the land that truly belongs to the tribe. Considering the human resource and carrying capacity of the tribe, "slowly" may be more conducive to the sustainable development of the tribe.

The "Eight Fools Organic Farming Areas" were slowly expanded from 0.1 hectares to 3.1 hectares with the help of the HDARES. The tribe did not enter the local markets until the quality has been stabilized, and now more people can know the Xinshe tribes and Kavalan culture and can protect the beautiful coastal ecology together.

INHERITING THE CULTURE OF FARMING

“Farming” is an important part of their tribal culture and it needs to be passed on to the next generation through actual actions. Therefore, in addition to planting, the Eight Fool Organic Farming Areas are also open to students of the Xinshe Elementary School for field class, so those students can participate in the process of rice growth such as transplanting, weeding, fertilizing, and cleaning pest snails (Fig. 5). Before harvest, the organization will hold a sketch competition in the field and record the beautiful scenes of native rice fields. The result seems to be successful, but success is contributed by the guidance of the HDARES and the persistence of tribe people to achieve their goal of “planting delicious rice with our own land.” Their local knowledge has spread and has been recorded in the courses by the students. It is an important way to keep and inherit Xinshe tribe and Kavalan’s culture. (Tseng and Huang, 2016)



Fig. 5. Xinshe elementary school field class students

CONCLUSION

Although the agriculture in Xinshe tribe gets better than before, local people still need more ways to increase their income and promote Kavalan’s culture. Elder people who know more traditional knowledge are getting older. They need young people and new blood to promote every part of their tribe. In learning and practicing rebuilding a culture, Xinshe tribe aims to cooperate

with many institutes, to absorb the new knowledge and re-think, and re-connect the traditional culture which can make the practice much smoother. Gradually, agriculture is no longer just agriculture, but with various meaning, taking into account the lifestyle of multiple functions.

The concept of ecology extends beyond paddy fields, it is also a part of life. For example, farmlands can be used to enrich the educational content of the Municipal Xinshe Elementary School. Students from the Municipal Xinshe Primary School and Preschool can visit the farm monthly to perform various farming activities, enabling them to learn about the rice-growing process and agricultural ecosystem. Rice growing allows children to connect with their land. Moreover, for the Kavalan family, rice is something that brings the family together and allows their family bonds to become stronger.

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