



Norwegian University  
of Life Sciences

**Master's Thesis 2021 30 ECTS**

Faculty of Landscape and Society

# **Farmers' Perceptions on the Leopard Cat Conservation Program in Taiwan: Conflicts or Co-existence**

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International Environmental Studies

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Declaration I, Yun-Yue Hsu, declare that this thesis is a result of my research investigations and findings. Sources of information other than my own have been acknowledged and a reference list has been appended. This work has not been previously submitted to any other university for award of any type of academic degree.

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Date: August 15, 2021

# Abstract

The leopard cat (*Prionailurus bengalensis*) is one of the small felines commonly distributed in Asia, and it once widely inhabited low altitude areas below 1,500 metres. However, with the current population plummeting and the distribution areas unclear, it has been classified as an endangered species by Taiwanese government. A community-based conservation program, the “Leopard Cat Rice” program was established in 2014, which aimed to change the locals’ perceptions about the leopard cat and restore its habitat. This program underwent structural changes in 2019.

This research aimed to clarify the factors that influence the local farmers to participate in the program, and utilised semi-structured interviews to survey local farmers in Tungshiau Township, located in Miaoli County. A social enterprise and NGOs were also included in pilot interviews to provide insight and knowledge related to the development and implementation of the program. The interviews in this research were conducted with five local farmers, the leopard cat conservation scholar and the technical specialist, who are all the initiators of the program. The results showed that the participating farmers’ perceptions toward the program have acted as the main factors to influence their decision, followed by the livelihood implication and motivation. During the implementation of the program, if the participating farmers had personal autonomy in making farming-related decisions and maintained an open communication channel with the managerial authority, they would still maintain their contributions to the program, regardless of the impact on their livelihoods induced by the participation. In short, the participating farmers’ perceptions towards the program depended on whether they had the right and power to participate in the decision-making process and implementation of the entire program.

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# 1. Introduction

## 1.1. Research motivation

The Formosan Clouded Leopard (*Neofelis nebulosa*) was endemic to Taiwan, which used to be one of the largest, of the few, carnivorous felines in my country. Its existence has been regarded as a myth to us because biological surveys from the past twenty years have shown no signs of it in the mountainous regions (Rabinowitz 1988; Chiang 2007; Chiang *et al.* 2012). Until 2014, a research paper confirmed that it is recognised to be extinct (Chiang *et al.*). It is not the only extinct wildlife in Taiwan. Nowadays, many wildlife species are following the tracks of its history to extinction, and the Leopard Cat (*Prionailurus bengalensis*) is one of them.

The Leopard Cat has been listed on the IUCN (International Union for Conservation of Nature) as a species of “least concern” (IUCN Red List 2021). However, their population in Taiwan has been decreasing, currently estimated at less than 500 (Focus Taiwan 2019) and classified as an “endangered species” since 2019 (Forestry Bureau 2019). Many reasons affect the survival of leopard cats, but the most obvious and the main factor threatening its population is that its distribution has overlapped with a range of anthropogenic activities, due to human encroachment into its habitats.

The terrain in Taiwan and its population density, 673 per Km<sup>2</sup> (worldometer 2021), have limited the land utilisation, which results in negative impacts on economic growth. Because of that, large-scale developments in hilly and mountainous areas have been conducted for economic improvement over the past century. However, in recent years, the rising awareness of environmental protection has made more people realise the importance of wildlife conservation. Thus, stabilising or increasing economic growth while not infringing on the survival rights of wildlife has become a serious subject that we attach importance to.

One economic activity, agriculture, has contributed greatly to the economic development and growth in Taiwan. Thus, huge areas of hilly terrains have been altered into agricultural landscapes. Namely, the development in agriculture has resulted in habitat loss and fragmentation for leopard cats and led to the reduction of its populations. Compared to the past century, the population density of leopard cats has decreased dramatically and stepped into an unclear status (Chen *et al.* 2016). Nowadays, Miaoli County is confirmed to be the region where a small group of leopard cats has survived, especially around the low-altitude mountainous and hilly areas in Tungshiau Township (Li (李運金) 2020), which has

always been recognised as an “Agricultural Township” (Chen 2021). Because of the rising issue of leopard cats’ survival, more people have participated in the development of organic and sustainable agriculture in the past seven years (阿虎加油 2021a). The development of this sustainable agriculture is mostly combined with the concept of wildlife or ecological conservation for promotion and marketing. Amongst them, the “Leopard Cat Rice” program has successfully attracted the public’s attention to the threat of leopard cats’ survival.

I have always firmly believed that stable personnel development and cohesion are indispensable to the success of a program. This cohesion can be triggered by taking into account participants' needs while achieving the goal. Nowadays, the follow-up evaluations of the sustainable agricultural programs in Taiwan only consider the progress of ecological restoration to adjust the direction and progress. The needs of farmers, the most important part to promote the program, are rarely considered. Therefore, the main purpose of this research is to utilise in-depth interviews with participating farmers and related personnel of the “Leopard Cat Rice” program to explore the impact of the program on them. Exploring the farmers’ motivation to participate and their perceptions of the program helped us to understand the relationship between the farmers in the local community and the development of the wildlife conservation program, to identify the potential factors that influence their decision to participate in the program.

## 1.2. Research purpose

This research can be classified as exploratory. The research area is Fengshuwo Village, located in Tungshiau Township of Miaoli County in Taiwan. This area was chosen because it’s the place where the “Leopard Cat Rice ” program originated and the framework of this program is the main topic in my thesis. Before the “Leopard Cat Rice” program was launched, its initiator, Dr. Chen, had conducted a preliminary survey that aimed at initiating a community-involved conservation program in Miaoli County (Chen 2014). Thus, the “Leopard Cat Rice ” program can be said to be a tailor-made conservative project based on the results of that survey. And now, seven years after the program has launched, this research aims to discover whether this program is following the vision of the initial survey to achieve their goal. A series of in-depth interviews were conducted with the local rice farmers who participated in the program. This research aims to clarify their main motivations for being part of the program, the impact on their rice cultivation mode and rice production framework after joining the program. These two outcomes were extended to explore whether the changes



have impacted their livelihood, what their perceptions are toward this program, and finally if they had willingness to continue participating in the program. The final step in this study was to analyse the factors that motivated their decisions to stay or withdraw from the program.

According to my research purpose, my research questions are as follows:

- 1) What are the main factors for farmers to participate in the “Leopard Cat Rice” program?
  - 1.1) How are the livelihoods of the local farming community influenced by the implementation of the “Leopard Cat Rice” program?
  - 1.2) What are the participating farmers’ perceptions of the “Leopard Cat Rice” program?

## 2. Background

The demand from human beings for mother nature's ecosystem services has been escalating because of the increasing population. According to the Worldometer (2021), the population trend in Eastern Asia, in which the population is ranked second in Asia, has been rising since the nineteenth century, even with a negative population growth since 1990. Because of that, human-wildlife conflict (HWC) has become a pronounced issue. When I first searched for information or data related to HWC occurring in Eastern Asia, I found that most research conducted in Asia was located in Southern Asia. Because, compared to Eastern Asia, Southern Asia is more vulnerable to this issue (Karanth & Madhusudan 2002; Asimopoulos 2016; Anand & Radhakrishna 2017). However, the drivers of HWC are varied. The geographical environment, the national economic development, and the history of civilisation can easily activate severe HWC between mankind and wildlife. Thus, to generalise the scale of the issue by analysing the situation in the entire region is arbitrary.

The leopard cat is native to North and East Asia (Lee *et al.* 2015) and is also the most widely distributed felid species in Asia (Miao 2017). However, there is not much research about its status. In Japan, much time and effort has been dedicated to long-term surveys about the group size and species distribution of the Iriomote cat (*Prionailurus bengalensis iriomotensis*), a subspecies of the leopard cat, and the Tsushima leopard cat. Nowadays, there are approximately 100 Iriomote cats on Iriomote Island and 83 to 115 Tsushima leopard cats on Tsushima Island. Both of them are marked "Endangered" by the Japanese government. In addition, the Iriomote cat has been included in the IUCN Red List as an "Endangered Subspecies" (Izawa *et al.* 2009). In South Korea, the leopard cat has been designated as "Endangered Species Type II" by the Wildlife Conservation Act (Lee *et al.* 2015). In Taiwan, the leopard cat was once widely distributed among the hilly terrain below 1,500 metres above sea level. However, its distribution and group sizes nowadays are not transparent due to the shortage of research data. Meanwhile, it was classified as an "Endangered Species" in 2019 (Forestry Bureau 2019). With such an uncertain status, the leopard cat in Taiwan is facing the risk of extinction.

To understand the deteriorating survival crisis of leopard cats in Taiwan, there are three parts in this section which describe the context. First, details of the changes in its group size and distribution are listed; the second part explores the reasons for its declining population; the last part introduces the leopard cat conservation program, which was initiated by the private sector to stabilise its population and restore its habitats recently in Taiwan.

## 2.1 Historical overview

The first documentation of the leopard cat was shown in the first gazetteer of Miaoli County (Shen, 1894). This record included descriptions of the morphology and characteristics of the leopard cat. The leopard cats were described as tiny wildcats, the size of a house cat but with the power of big cats. Based on the description, leopard cats might appear relatively widespread with a stable population during that period. In 1929, the population status of the leopard cat in the article of Tadao Kano, a Japanese zoologist and anthropologist, was indicated as “relatively abundant”, because they were not rare to be seen and primarily inhabited less forested, hilly areas at altitudes between 1,300 to about 1,400 meters. In addition, the illustrated encyclopaedia of mammal species in Taiwan (1932), which is written by Yasuichi Horikawa, a Japanese teacher and biologist, mentioned that leopard cats were widely distributed in lowland and extensive plain habitats at altitudes below 1,500 meters. Moreover, in 1937, an investigation report organised by the then-Taiwanese Government under Japanese occupation had hunting records, which indicated there were 1,153 leopard cats across Taipei, Hsinchu, Taichung, Kaohsiung, Taitung, and Hualien in 1933. Furthermore, Kuroda Marquis Nagamichi, a Japanese ornithologist, in his book (1940), documented records which measured the abundance of leopard cats in Nantou.

However, the situation of spotting leopard cats almost everywhere seemed to hit a critical point in the 1970s. Dale R. McCullough (1974) reported that the distribution of leopard cats was even across the different regions in Taiwan at that time, but leopard cats were less frequently detected in the wild. In short, leopard cats had already confronted the high risk of extinction at that point. Afterwards, in less than 50 years, an outcome from a project that was conducted in Hsinchu and Miaoli between 2005 and 2008 (Chen 2008), showed no occurrence of leopard cats in Hsinchu anymore. Moreover, wildlife research was conducted in Kenting national park on the Hengchun Peninsula (Pei 2004), the southernmost part of Taiwan, using camera trap methods. This research speculated that the leopard cats might have been extirpated from that range.

Fortunately, in contrast to the findings in Northern and Southern Taiwan, a zoological study was conducted by Ching-Ming Wang in Nantou from 1991 to 1992, which showed the leopard cat might still inhabit that county. Yet only one of three different areas recorded the sound and faeces of leopard cats. Until 2016, Lin *et al.* summarised, based on the capture of its photos and excrements from the project, that the several townships in Nantou, which are nearby the border with Taichung, could be the potential habitat range of leopard cats.

As for Miaoli, the county is estimated to have the most stable population size of leopard cats, although there are still leopard cats that inhabit low-elevation areas there, at altitudes < 500m (Lee 2015). However, most of them can only be found in its adjacent townships to Taichung (Chen, 2014). Equivalently, the results from projects conducted in Taichung (Chen (陳美汀) 2017; Zhang (張育誠) *et al.* 2019) between 2016 and 2017 found the tracks of leopard cats in only four of six survey areas. Those four areas where they obtained the evidence of leopard cats were the townships that connect to the neighbouring counties, Miaoli and Nantou. Combining the results from these projects, we might assume that the leopard cats probably dwell in the lower mountainous zone in Miaoli and Nantou, and Taichung could serve as a corridor for leopard cats travelling between these two counties.

## 2.2 The threats

According to the literature above, three main factors contribute to the decrease in the population of leopard cats, including retaliatory killings, poaching, and development. First, it is widely known that the population of leopard cats has been in perpetual conflict with poultry farmers who live in the areas which overlap with leopard cat habitat. Leopard cats were documented as a mammal that would prey on domestic poultry raised by aboriginals in both the article of Tadao Kano (1929) and the book of Yasuichi Horikawa (1932). Therefore, aboriginals conducted retaliatory killings and acquired the cats' flesh and fur as compensation for their loss.

Secondly, poaching is a threat to many wildlife species, including the leopard cats. Yasuichi Horikawa (1932) surveyed local tribes and uncovered that indigenous people had long-term traditions to utilise the skin of leopard cats for clothing or handicrafts. In addition, an advertisement in 1936 shows the skin of leopard cats was sold per yard (Li(李璟泓) 2015). From the cases above, we may extrapolate that the commercial use of the leopard cats' skins and parts had become substantially popular, and perhaps the market had reached maturity at that time. Even until 1987, 15 years after the bans on wildlife poaching and trading were issued, a news report still emphasised that the number of leopard cats was threatened with extinction because of illegal hunting (Li(李璟泓) 2015). Moreover, in 1988, two injured leopard cats were captured for trading by a villager who lived in Yunlin, the southern east part of Taiwan (Li(李璟泓) 2015). This news reflects on how common the poaching of leopard cats was at that time and indicated the enforcement of the bans was probably weak to form or change people's behaviour and perspectives towards leopard cat conservation.

Wang (王穎) (1988) researched the local diners that open in rural fields or mountains and discovered that there was a trend to serve the meat of leopard cat as a delicacy from 1985 to 1988. In addition, there was a market for the exotic pet trade of leopard cats, and the market price was between TWD 1,000 to TWD 10,000. The average monthly salary in Taiwan at that time was between TWD 6,900 to TWD 8,130 (勞動部 2021). It cost at least 1/7 of the monthly earnings or more to buy a leopard cat and keep it as a pet, so normally those leopard cats were smuggled overseas as international trades. Interestingly from his survey, even as the market was striving, most participants recognised that the decline in the size of the leopard cats' population was "noticeable". This indicates its population in the wild had been lower than it used to be, however, the plummeting numbers of leopard cats to those participants had not seemed to be a threat to its survival, and this state of mind might be the main reason that the leopard cats' trade was increasing. The negative impact of widespread poaching either by the aboriginals who live in mountainous areas or the locals who dwellers in the plain increased the vulnerability of leopard cats.

Finally, human development also threatens the leopard cats. The literature review showed that leopard cats mostly inhabit hills with low elevation, so it has been easy to be affected by human encroachment induced by social and economic development. In addition, the development increases the fragmentation of its natural habitat. According to the research of Chen *et al.* (2016), the core activity areas of male leopard cats do not overlap with the females', which means leopard cats are territorial. They also discovered the leopard cats prefer primaeval forest habitats over agricultural or industrial areas (Chen *et al.* 2016). Leopard cats are nocturnal, and this means they do not like to expose themselves in open areas. Instead, they live in environments with fewer anthropogenic activities. Hence, the fragmentation of the habitat does not only compromise the suitability of their living surroundings but restricts them from selecting an area that does not overlap with other leopard cats'. Therefore, they might need to travel a long distance to find their habitats. Under this circumstance, it is a high possibility for them to cross the roads, increasing the risk of roadkills.

Roadkill is another hindrance in line with the societal development that limits leopard cats' capacity to expand their territories. Taiwan Roadkill Observation Network (2021) has documented the number of cases of leopard cat-vehicle collisions from 2011 to 2021, and it suggests that it increases every year. The highest frequency distribution of the road casualties was in 2019. However, even the lower roadkill rates before and after 2019 may not reflect the

reality of these kills, because the data of roadkill cases relies heavily on public reporting to the Research Institution. Many people confuse the physical features of leopard cats to domestic cats and might mistakenly recognise leopard cats as stray cats and fail to report them. Moreover, the corpses were usually found along industrial roads in rural regions where traffic is usually busy and inhabitants are few, so it is not easy to notice their corpses.

### 2.3 Leopard Cat agricultural conservation programs

From the information above, it can be seen that there is more than one driver that affects the population and group size of leopard cats, so urgent action must be taken to develop a program to protect leopard cats. All current data has shown that the relationship between human beings and leopard cats is intense due to the overlap between leopard cat habitat and mankind's living environment.

In Taiwan, most leopard cat habitats mainly occur on private-owned lands. Although the Forestry Bureau has the legitimacy to establish a protected area for leopard cats, anthropogenic activities would then be restricted, which might deepen public resentment against leopard cats. Therefore, the Taiwanese government has not actively reacted to this survival issue. Because of the lack of government protection, a few leopard cat conservation programs have been established by the private sector, conservation scholars, or NGOs. The current conservation programs are "Leopard Cat-friendly Agricultural Product" (阿虎加油 2021b) and "Leopard Cat Rice" (楓樹窩石虎米 2021). These programs mainly revolve around the development of sustainable agriculture and encourage the local farmers to modify their farming practices. Amongst those programs, the "Leopard Cat Rice" program originated in Tungshiau Township in Miaoli County and is the core theme discussed in this research. Its background, structure and content are elaborated in subsequent sections.

### 2.4 The structure - previous & present systems

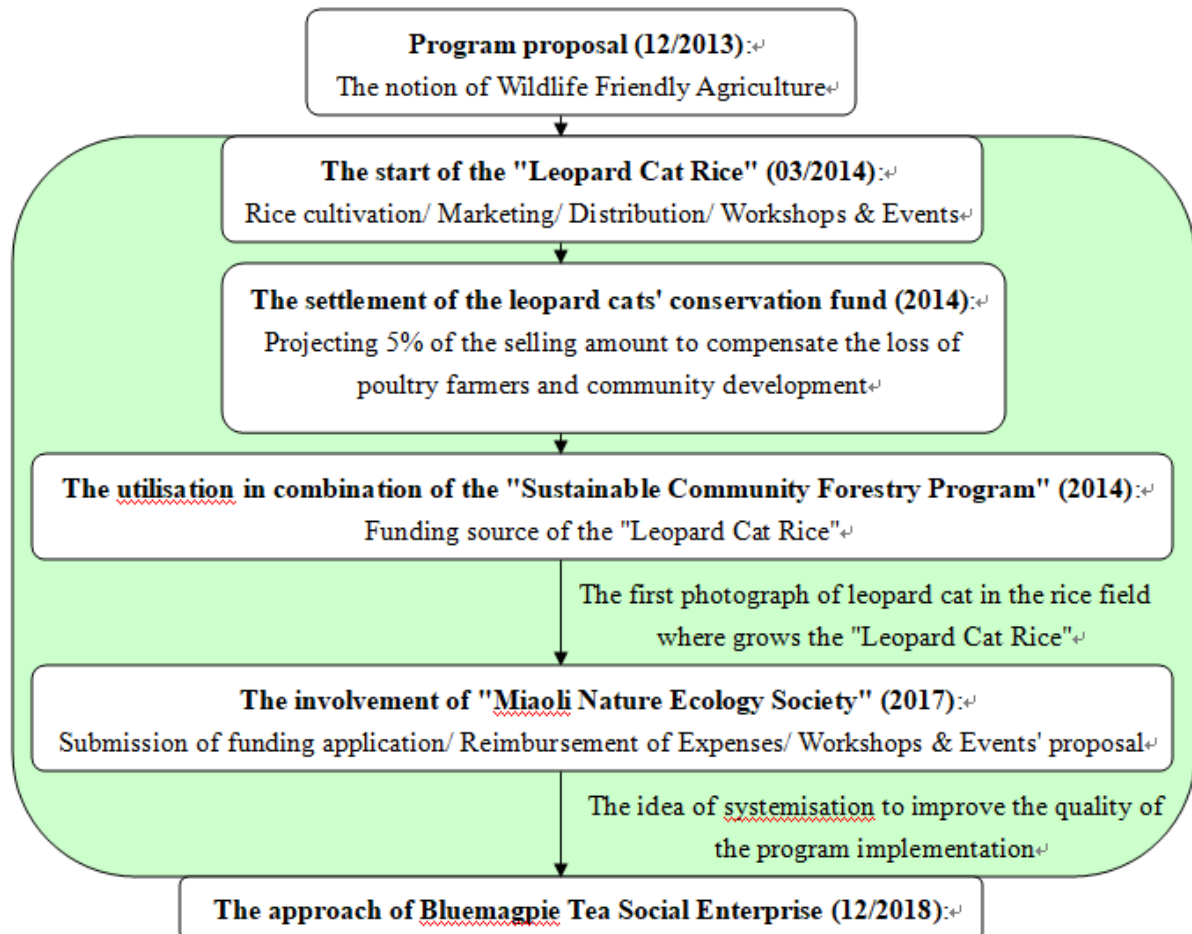
The formulation of the "Leopard Cat Rice" program started in 2013 following the research period of the project "Initiating Community-involved Conservation Activities for Endangered Leopard Cats in Miaoli, Taiwan" (Chen 2014) by the leopard cat conservation scholar, Dr. Chen. She was inspired by the successful case of the conservation program in Northern-Eastern Taiwan (Fang *et al.* 2015) to launch a leopard cat conservation program in March 2014. The steps that led to the creation of the "Leopard Cat Rice" program can be seen in more detail in Fig. 1.

The program was constructed and operated in association with a unity of different individual entities, including Dr. Chen, the local farming community, and a technical specialist. The decisions that were made during the implementation of the program never needed to be reported to any authorities. Thus, there was no hierarchy in the program and the structure of the program could be seen more as an informal partnership (Fig.2). The program's framework was prone to a top-down approach in the terms of farming practice and the implementation goal. Otherwise, the power was distributed equally to all individual entities. In addition, the brand of the "Leopard Cat Rice" is designed to be a product of the entire community and also is produced with the "Participatory Guarantee Systems" (PGS), which is the locally focused quality assurance systems (IFOAM-Organics International 2020). Therefore, most decision-making procedures have bottom-up features.

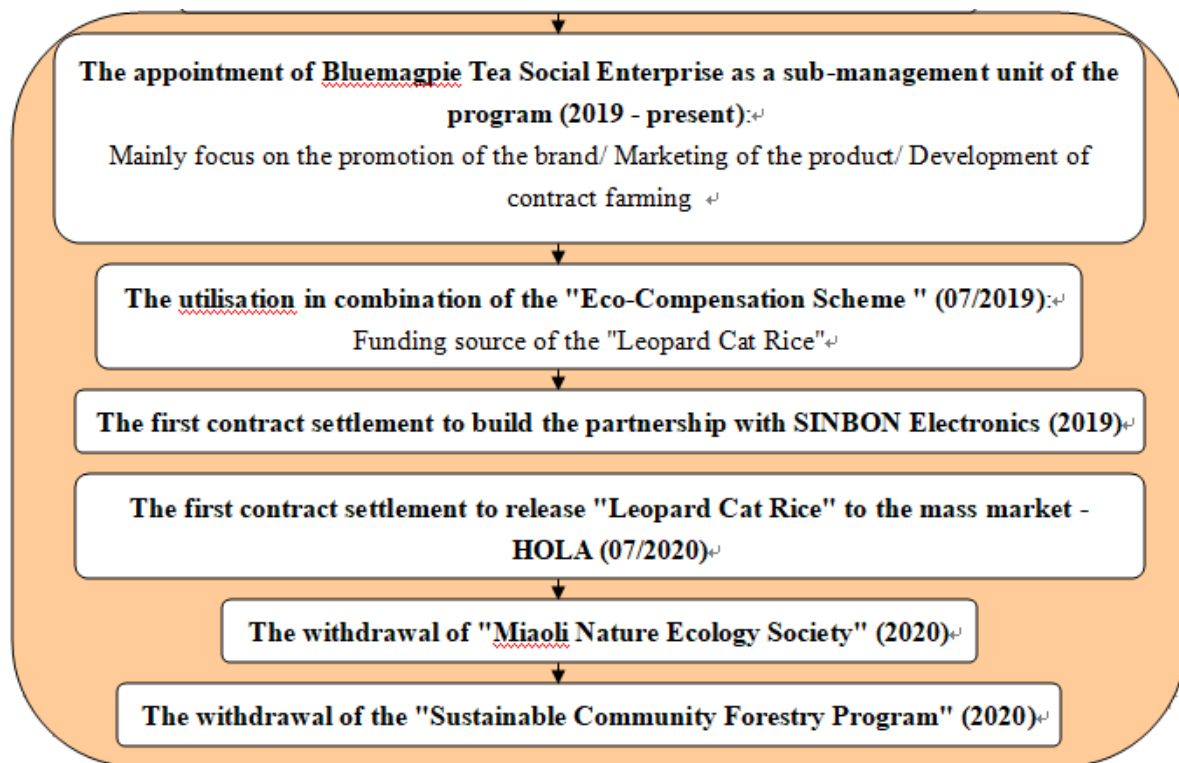
In 2019, the Bluemagpie Social Enterprise, a social enterprise established in 2015 that imported the idea of "River Basin Recovery" from Japan to Taiwan (Taiwan BlueMagpie Tea 2020) was granted credentials to sub-manage the program and has supervised the "Leopard Cat Rice" production chain ever since (Fig.1). Since then, the structure and framework of the program have undergone major changes. The program has turned into a hierarchical framework composed of three layers. At present, the highest supervisory sector is the social enterprise, and it formulates regulations and decides management policies based on the implementation goal for all stakeholders in the program. The second layer is the cropland project director who is vested with the administering authority to manage and monitor the compliance of the program. He can also make decisions based on his own judgement, for example, deciding the allocation of agricultural machinery and when to harvest. The bottom layer is the basic agricultural producer which includes the farmers who participate in the program in the local community. The framework of the program now has adopted an entirely top-down approach (Fig.2).

In addition to the changes in the structure and framework of the system, the financial components in the program have also undergone considerable changes. During the previous system, with the consent of all individual entities, 5% of the total revenue of the rice was used as "Leopard Cat Conservation Fund." This money was to help the poultry farmers in the township to strengthen the chicken coops and compensate for their economic loss, which resulted from the foraging behaviour of leopard cats. Meanwhile, the additional financial input injected into the program was from the government by applying for subsidy, compensation, and executing government projects. Nowadays, at the present system, the social enterprise has decided to donate 5% of the total profit generated by the sale of the

“Leopard Cat Rice” to the “Leopard Cat Association of Taiwan”, “Miaoli Natural Ecology Society”, and “Taiwan Environment Information Association”. In addition, the funding source of the program is no longer dependent on the financial support obtained by undertaking government projects

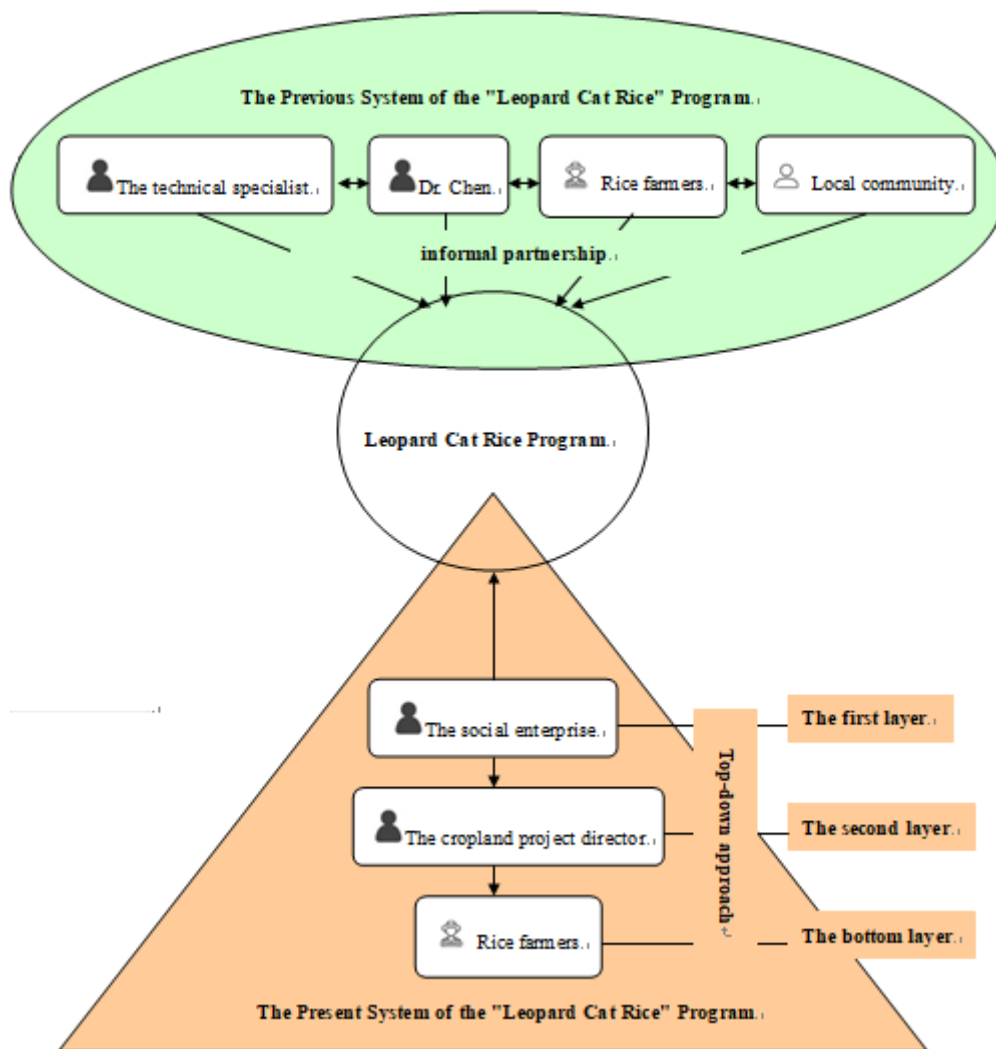






**Fig.1** The development history of the “Leopard Cat Rice” program

Source: Data was collected from the information provided by participants during the interviews (The figure was made by Yun-Yue, Hsu)



**Fig.2** The structure of the “Leopard Cat Rice” program- The previous and present systems (The figure was made by Yun-Yue, Hsu)

During the development of the “Leopard Cat Rice” program, the technical specialist played an extremely important role in assisting Dr. Chen to shape the goal of the program. As a government employee for a long time, he is familiar with conservation-related policies and projects and programs in the government. Although he was not participating in the project on behalf of the government, he guided the farmers who joined the program to apply for the subsidy and to obtain financial aid for their economic loss brought on by sustainable farming practices. Meanwhile, he provided advice for the formation of the program, so that the goals of the project can be in accordance with the conservation blueprint of the government. Because of that, the program is in line with the government’s program and qualified to apply for some financial support. All the government programs, subsidies, and policies utilised for the promotion of the “Leopard Cat Rice” program are explained in the following section, as they set the stage for further understanding the results of this thesis.

#### 2.4.1 Sustainable Community Forestry Program

The object of the sustainable community forestry program is to build consensus among the residents and cultivate the abilities to conserve or sustainably use the ecosystem services. The fund is provided to assist the locals in developing the skills to conduct regional ecological surveys and eco-tourism. This program creates opportunities for communities to cooperate with the Forestry Bureau on forest management and nature conservation. Any community projects related to ecosystem conservation are qualified to apply for and utilise the fund. According to its regulation (行政院農業委員會林務局 2018), the applicant has to be the Community Development Association or NGOs. The fund can only be applied for once a year, and the project has to be fulfilled to apply for the fund the following year. Projects that can apply for this fund can be related to: a) the conservation of wildlife or native plants' habitats; b) the improvement of deteriorating habitats for wildlife or native plants; and c) the removal, prevention and management of invasive alien species.

The Fengshuwo Community applied for and received the fund around TWD 30,000 each year, with the assistance of the technical specialist from 2014 to 2016 and the Miaoli Nature Ecology Society in 2017 and 2018. The fund was set up to compensate the farmers for the manual labour that was needed because of the implementation of sustainable farming practices. However, no one was willing to take the compensation, so with everyone's agreement, they decided to utilise the fund to enhance the fence structure of the poultry coops in the community, to minimise the possibilities of leopard cats preying on the locals' livestock. In addition, the fund was also utilised to purchase small agricultural machines for the production of "Leopard Cat Rice." The utilisation of the fund was flexible, and it was also utilised several times to support community projects, such as "Congregate Meal Service for Elders" and "Farming Camp."

#### 2.4.2 Organic and Eco-friendly Farming Subsidies

The organic and eco-friendly farming regulation was established in 2017 by the Council of Agriculture in Taiwan (The Executive Yuan Gazette Online 2017) to improve the ecological environment and sustainable agricultural development. Farmers or supportive organizations can apply for subsidies through this regulation. The subsidy is categorised into two types: a) the subsidy to reward the environmental positive outcomes; and b) the subsidy to compensate for income reduction. The subsidies can be applied for a maximum of 3 consecutive years, but the farming area needs to be at least 5 hectares and verified as organic.

If the ownership of the farming area belongs to others, the applicants need to enclose the leasing contracts of at least 2 years as required documents.

In this research, Tse-Xin Organic Agriculture Foundation (TOAF), an NGO that assists participating farmers in verifying their farming area as an eco-friendly agricultural area, was authenticated by the Council of Agriculture as an “Environmentally Friendly Farming Promotion Group” in 2017 (慈心有機 2021a). Therefore, TOAF can assist the participating farmers to apply for the subsidy.

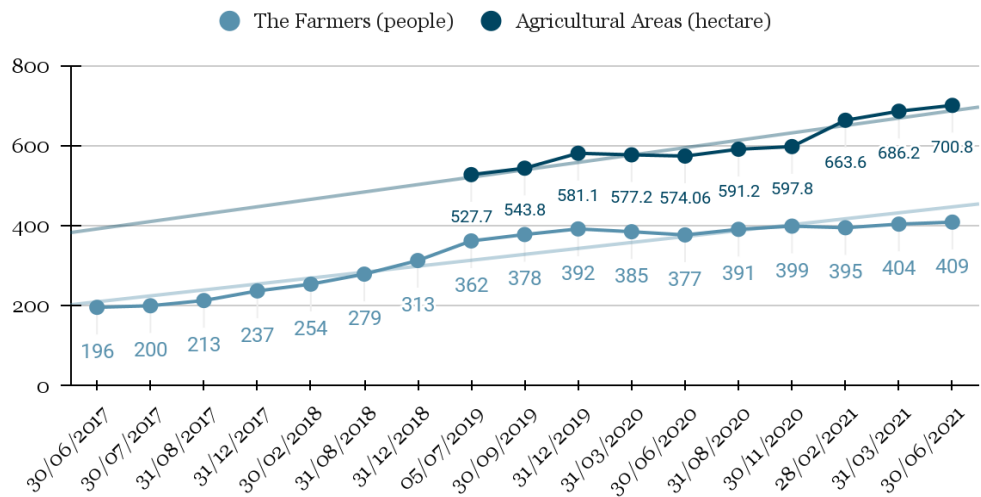
#### 2.4.3 The Green Conservation Label

The Green Conservation Label is a certification promoted in 2010 by the Forestry Bureau and TOAF, to improve the ecology of agricultural areas (慈心有機 2021b). The principle of farming practices under the Green Conservation Label is to cease the utilisation of chemical synthetic pesticides, chemical fertilisers, and herbicides. In addition, the utilisation of organic agricultural substances that are harmful to the environment are also regulated based on the cultivation environment of different crops. For example, the application of camellia seed cakes to suppress the spread of the golden apple snail (GAS) is forbidden in the agricultural areas which are aimed at conserving and restoring aquatic animals (Kijprayoon *et al.* 2014). In summary, field visits will be conducted by the project facilitators to determine if the farmers are allowed to apply certain natural agricultural substances in their fields.

The agricultural areas of the applicants who apply for this label need to at least have one threatened species in the area. The validity period of the label is 3 years, which means the applicants will be required to provide reports of the farmland soil fertility and water quality from the Agricultural Research and Extension Station to apply again if they wish to continue with the label. The application fee is covered by the “Organic and Eco-friendly Farming subsidies”. In addition, during the period of holding the label, the unannounced inspection of chemical residues on crops will be conducted once per year. If the crops that are examined contain pesticides by other inevitable factors which are not caused by the one who is farming in the area, the applicants can appeal for re-inspection. However, the relevant fee will be covered by the applicants. Conversely, if the violation is confirmed to be caused by the one who is farming in the area, the label will be terminated immediately without the right to appeal, and all agricultural products shall not be sold in the name of the Green Conservation Label.

In Taiwan, arable lands are fragmented which leads to agricultural areas where organic farming may be adjacent to farmlands where conventional farming practices (CF) take place. Therefore, agricultural areas are at a high risk for pollution, and thus, the certification of organic farming has always been difficult to be promoted in Taiwan. However, compared to the high regulations needed for organic farming certification, it is easier to apply for the Green Conservation Label, and so the cases of applying for the Label have been showing a solid growth trend (Fig.3).

### Population of the farmers and the agricultural areas with the Green Conservation Label



**Fig.3** The population of the farmers and the agricultural areas with the Green Conservation Label from 06/2017 to 06/2021

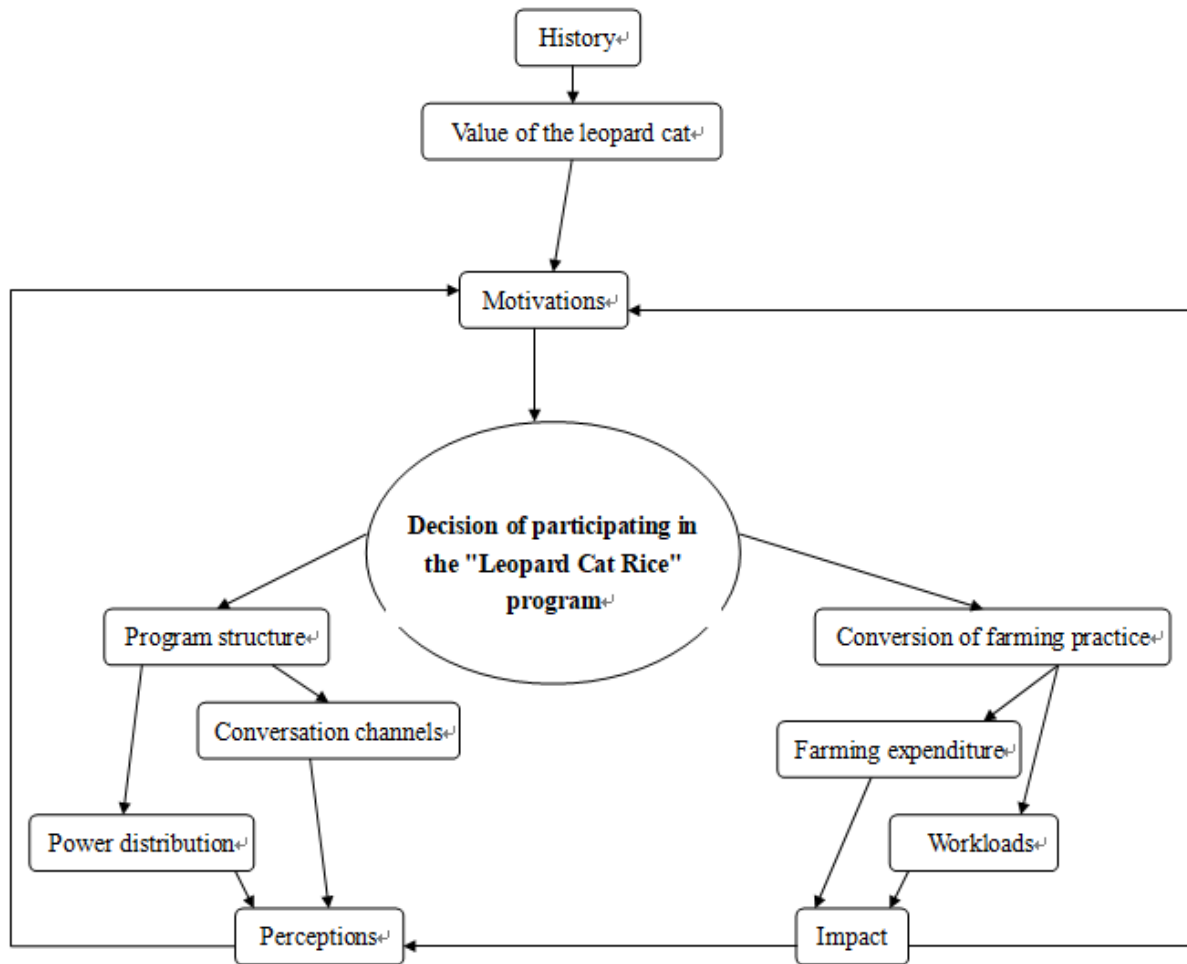
Source: Data was collected from the website of 慈心有機 (The figure was made by Yun-Yue, Hsu)

### 3. Conceptual framework

In this research, the farmers' decisions to participate in the program were explored. Through this exploration, concepts surrounding what may be expected to influence their decisions were established. I explored how external factors, such as their farming practices and the changes in their livelihoods as a result of the program, overlapped with other internal factors such as their motivation for establishing the program, their environmental knowledge, and the attitudes toward the leopard cat that shaped their perceptions.

The participating farmers' perspectives towards the program structure was the base of the conceptual framework in this research. The goal was to move from this base to understanding the farmers' future decision toward participating in the program. This was assumed to result from the interplay between these factors and the farmers' motivations and expectations. The reactions of the participating farmers toward the interventions of the sub-managerial mechanism from the social enterprise triggered unexpected reactions, which had turned the feedback system in this research into non-linear feedback. Nonlinear feedback systems usually involve human factors (Barlas 2007) and are reflexive (Hollings 2001), so it could be complex to generate the solution for the issues by defining the core of the problem. Following the factors and their potential interplay in this conceptual framework, it might generate various outcomes depending on how the social actors shape their decision-making processes based on their backgrounds and beliefs.

In this research, I sought to examine the relationship between different factors to influence the decision-making processes of the participating farmers. The results chapter was organised to expose the modifications the participating farmers encountered after joining in the program. In the discussion chapter, the external and internal factors to the impact of the participating farmers' livelihoods were exposed through the analysis of the data. The quotations from the interviews with different stakeholders were listed to illustrate the connections between different factors and how those factors weighed in their decisions. The figure below is a diagram of the conceptual framework in this research.



**Fig.4** Conceptual framework (The figure was made by Yun-Yue, Hsu)

## 4. Methodology

A wildlife conservation program should possess adequate management strategies to effectively create harmony amongst wildlife and mankind. While it is essential to alleviate the negative impact of land-use patterns, motivating participation in conservation programs is complex and should improve participant's livelihoods. To reach these goals, understanding the reasons behind people's decisions to participate in a program is fundamental. Thus, it is pivotal to be familiar with the community culture, values, connections between the locals and their livelihoods, and the wildlife's current situation.

Social science is one of the means to assist researchers and program planners to understand the complex network in human dimensions that are involved in the application of conservation programs (Bennett *et al.* 2017). Furthermore, conservation research on people's attitudes, perceptions, and perspectives toward the motivation of their decisions is mostly carried out by the qualitative approach. Qualitative approaches express the primary research objectives and participants' perspectives more generally (Torkar *et al.* 2011). It is the method used in social science to draw conclusions by collecting, classifying, summarising, and comparing the collected data. Interviews are a widely utilised methodology in the qualitative approach (Young & Rose 2018). Qualitative interviews are described as a form of conversation which guide participants to express their perspectives and perceptions (Rubin & Rubin 2011).

In this research, qualitative methods and interviews were utilised to investigate the motivation for participating in the conservation program, the farming practices, and perceptions of the conservation program amongst the local participating farmers. The following chapter contains details on the study area, research design, and limitations.

### 4.1. Study area

The study area in this research was set in Fengshuwo Village, which is 671.8028 hectares located in the middle east of Tungshiau Township (通霄鎮公所 2021). Tungshiau Township lies southwest of Miaoli County, where the leopard cat has been spotted most frequently in the mountainous areas. Miaoli County is the place where most leopard cats' samples were collected (Chen 2014) and the first municipality to pass the conservation bill protecting leopard cats (Laws and Regulations Retrieving System 2019). The economic backbone is agricultural-based development. However, the agricultural encroachment has threatened the leopard cats' survival by fragmenting its habitats. A case showed that the



utilisation of pesticides had put the leopard cat at great risk (Lu(呂欣濤) 2020). On the other hand, Tungshiau Township is also the village which is famous for the application of sustainable farming practices to cultivate rice. These modifications aimed to increase the prey base for leopard cats by restoring degraded ecosystems in the rice paddies. The contradictions over the current living conditions of the leopard cat were the reason that Tungshiau Township was chosen as the study area in this research

Tungshiau Township is an agricultural town located in the southwest of Miaoli County and has been entitled the name "Mountain Town " because of the mountainous regions (通霄鎮公所 2021), with the highest terrain at an altitude of 438 metres. It is about 16 kilometres long from north to south and 11 kilometres wide from east to west. The total area is more than 107 square kilometres. The terrain is dominated by hills, and the southeast side is higher than the northwest side, which shows a gradually decreasing slope towards the coastline. The topography in Tungshiau Township is unfavourable for industrial development, so many untouched forests remain. The water source of the town lies on the west side. The basin drainage of two major rivers, Tungshiau and Nanshi river, run through the township and account for three-quarters of the whole town.

The total population in Tungshiau Township was 33,471 people at the end of 2019 (通霄鎮公所 2020). The number of people in each household has been decreasing year by year since 1999, which shows that the family pattern in Tungshiau Township has developed into a trend of smaller families and the ageing population is increasing. More specifically, the population of Fengshuwo Village is 459 people. The younger generation mostly migrates to other cities for employment, so that the people now staying in the village are elders and younger.

## 4.2. Research Design

This thesis set out to understand the attitudes of the local farmers' toward the implementation of the "Leopard Cat Rice " program and clarify whether the program creates collisions on the livelihoods of the participating farmers. The research is qualitative and exploratory, utilising 21 semi-structured interviews, four of which were pilot interviews conducted in 2020. I spoke with farmers who have participated in the program, the leopard cat conservation scholar, the technical specialist who works in the Hsinchu Forest District Office, and the social enterprise that sub-manages the program. All interviewees are farmers

living in Fengshuwo Village, where they developed the “Leopard Cat Rice” program and started cultivating the rice in the first experimental rice paddy.

#### 4.2.1. Semi-structured interview

This qualitative research used the semi-structured interview (SSI) method. SSI is one of the major methods to collect relevant data, through the process of exchanging information during conversation. SSI usually consists of a mixture of closed- and open- ended questions and follows up with a series of how and why questions (Adams 2015). The open-ended questions in the interview played a critical role to collect participants’ viewpoints. Through the opinions they conveyed, researchers assessed their cognitions and perspectives related to the research questions. By utilising SSI, researchers designed the interview guides in advance based on the specific topic they wanted to investigate. The order of interview questions was adjusted according to the participants’ responses, which means SSI is quite flexible.

Pilot interviews were conducted in 2020 and were an extremely critical part of collecting the contact details of the participating farmers in this research. Interviewing the informants who were in close contact with the local farmers was the only way to acquire their contact information. Informants were selected because they had or have worked with the local farmers closely in this program, such as the leopard cat conservation scholar and the technical specialist. In order to protect the privacy of the participating farmers, their personal contact information was not provided directly from the informants. The informants in the pilot interviews acted as intermediaries to inquire about the willingness of the local farmers to participate in my interviews, and then they provided the farmers with my contact information to let them contact me after they agreed to be interviewed in this research.

There were only five participating farmers in this research. The contact information of the first of them was provided by the informants, and the remaining four were introduced by other participating farmers to be interviewed by me, which made the sampling method of this research snowball sampling, a non-probability sampling (Biernacki & Waldorf 1981). Snowball sampling is usually used in a situation where it is not easy to reach the potential participants. Researchers used the information provided by the first participant to contact other participants. This step was repeated several times until the sample size reached the numbers that the research required, or the information was saturated. The farmers participating in this research through the snowball sampling methods were less wary of me and were more willing to disclose accurate information.

The snowball sampling seemed as a perfect method for my situation to collect

participants. However, Noy (2008) indicated that the participants selected by snowball sampling method might come from the same specific portions of the population, which makes them probably sharing similar values over the same issue. What he mentioned was actually echoed in this research. In the process of data analysis, I found out that the participating farmers who shared a good friendship had relatively similar opinions towards certain sensitive issues.

In this research, the interview outline for the pilot interviews was constructed in December 2020 to conduct the pilot interviews with the secretary-general in the “Leopard Cat Association of Taiwan”, the founder of the “Bluemagpie Social Enterprise”, and the technical specialist. Through the pilot interviews, I collected relevant information regarding the current situation of leopard cat conservation in Taiwan and implementation of the “Leopard Cat Rice” program. The information obtained from the pilot interviews helped me construct and amend the formal interview guides with the participating farmers, the leopard cat conservation scholar, the technical specialist and the social enterprise, which means there were four different interview guides, in order to interview four different stakeholders in the implementation of the program. Some of the questions in each interview outline were the same, so as to understand how variate viewpoints derived from different positions in the implementation of the same program. Basically, all participants have been through interviews multiple times, and in total, there were 17 formal interviews conducted in this research, excluding four pilot interviews. Two interviews with the leopard cat conservation scholar, two were with the technical specialist, two were with the social enterprise, and the rest of the interviews were conducted with the participating farmers. Through frequent contacts, the relationships between myself and the participants became closer, which made the interview process smoother at times. In addition, some participants introduced other newcomers to participate in the interviews of this research, after we became familiar with each other.

#### 4.2.2. The process & interview guides

Formal interviews were conducted between February and May 2021. All the participants were contacted via emails or phone texting before the interviews. Each interview at least lasted for 2 hours. Each interview started with an introduction related to my background, the purpose, and content of the research, meanwhile informing the participants of their right to reject answering any questions that make them feel uncomfortable. The most important part was to let them know that the entire interview was confidential. This emphasis is particularly important for participating farmers because some questions were related to

their revenue and expenditure. In order to eliminate the interference of others that affects the participating farmers to convey their opinions and make the participating farmers feel secure while expressing their point of views, most interviews were conducted individually. All the content of the interviews needed to be translated from Chinese to English. All translations were done by myself, a native Chinese speaker. For the records, translation, and analysis in the future, all the interviews were recorded as audio files, and the permission of the participants was acquired in advance. If the participants felt uncomfortable with the recording, they preserved the right to reject it.

The interview guides in this research were created respectively for different stakeholders in the program, such as leopard cat conservation scholar, social enterprise, technical specialist, and the participating farmers. The design of the interview guides was not only based on the research topic, but also through the suggestions of the informants in the pilot interviews. The interview guide consisted of four topics as follows: First, farmers' characteristics; Second, rice cultivation practice; Third, post-harvest production; and fourth, participating farmers' attitudes and perceptions toward the program. Supplementary questions were always added for the further follow-up interviews to obtain in-depth information and knowledge to clarify the confusion emerged from individual interviews.

Interview, to my point of view, was one of the exciting parts to conduct in this research. However, regardless of me or the participants, more than two hours of interviews were very exhausting. The brains got tired after a long time of conversation, especially to elder farmers, so the answers they expressed might occasionally be repetitive. However, because of the time difference respectively in Norway and Taiwan coupled with our tight schedules, there was a lot of time I spent waiting for them to have spare time for the interviews. Therefore, the situation forced me to extend the length of the interview to acquire as much information as I needed every time.

#### 4.2.3. Coding & analysis

Thematic analysis was applied on the data in this research. Boyatzis (1998) expressed that thematic analysis acts as a translator to convert and organise different data sets, so readers can easily understand the story that the researchers tried to describe.

In this research, all the interview audio files were transcribed, and extensive notes were penned down during the reading process. The notes were categorised according to the topics in the interview guides and the level at which the topics were repeated. The reason to pay attention to the repetition level was because some secondary issues worthy of analysis

and discussion might emerge through participants' repetitive answers. A Word document was created to classify the notes into different themes, such as the tangled history between the participating farmers and the leopard cat, farming practices, post-harvest production processes, the development of the program, and the implementation of the program. A chart was drawn with four tables in it, and each table was entitled with the name of each theme. Each table consisted of the questions that have been categorised, and the answers to different farmers in the same question were marked with different colours.

After organizing the data into preliminary themes, I reiteratively reviewed the transcripts and the themes until I felt saturation, and no new information was found that did not fit into the themes. Meanwhile, I spotted the themes of farming practice, and the implementation of post-harvest production were most frequently discussed, followed by the implementation of the program. I carefully reviewed individual questions under these themes to arrange them in order and found out their connection to the research questions. Afterwards, the questions with the most divergent answers were cross compared with the participating farmers' backgrounds, farming experiences and beliefs to find out the most possible factors to cause the participating farmers to generate different perceptions under the same implementation requirements and management in the same program.

## 5. Results

### 5.1. Participating farmers

Table 1 presents the summary of the characteristics and farming backgrounds of the participating farmers in this research and the detailed content of interviews are elaborated on each topic, respectively.

**Table 1.** The farming backgrounds and characteristics of participating farmers  
Source: Data was collected from the information provided by participating farmers during the interviews (The table was made by Yun-Yue, Hsu)

	<b>Farmer A</b>	<b>Farmer B</b>	<b>Farmer C</b>	<b>Farmer D</b>	<b>Farmer E</b>
<b>Farming Background</b>	Census of agricultural operation to operate his own business	Continue farming	Continue farming	Continue farming	Census of agricultural operation to work in the other county
<b>The Year to Join the Program</b>	2014	2014	2014	2014	2014
<b>Area of producing “Leopard Cat Rice”</b>	0.38 hectare	0.58 hectare	0.67 hectare	0.77 hectare	0.82 hectare
<b>Number of Rice Cultivation Plots</b>	One	Several	Several	Several	One
<b>Source of Water</b>	Pump station	Reservoir	Reservoir	Reservoir	River
<b>Extension</b>	No	Yes	Yes	Yes	No
<b>The Ownership of Farming Areas</b>	Self-owned	Self-owned + Family-owned	Self-owned + Family-owned	Self-owned + Family-owned	Self-owned
<b>Certificate</b>	1. The Green Conservation 2. Organic Farming	The Green Conservation	The Green Conservation	The second year of applying for the certificate of The Green Conservation	The Green Conservation (Considering to apply for the certification)

					of Organic Farming)
<b>Source of Income</b>	Full-time job + Farming	Full-time job + Farming	Full-time job + Farming	Full-time job + Farming	Full-time job + Farming + Poultry farm
<b>Characteristics of Poultry Farm</b>	Self-consumption	Self-consumption	Self-consumption	Self-consumption	Small scale business

There was a total of five farmers participating in the research interviews, and they have resided in Fengshuwo since they were born. They were all born into agricultural households that have conducted farming practices in Fengshuwo for centuries. Thus, all participating farmers helped their families with agricultural work from an early age, and as a result, they have accumulated certain years of farming experience and a considerable level of farming knowledge, which make them specialised in agricultural cultivation. Because of such a background in agriculture, three of them chose to stay in the local community to inherit the family business and kept farming after graduating from school. There were only two farmers who decided to work and start their own business in other counties, with the desire of improving their lifestyle; even with most of their lives away from the agricultural profession and lifestyle, they still decided to return to the community to live after retirement.

### 5.1.1. The motivation & contribution

Four of the five participating farmers who were willing to be interviewed in this research can be considered to be initiators in developing this program because they were participating in the program voluntarily from the beginning. They started it from the trial phase of the program, and they are the ones to bestow the name of “Leopard Cat Rice” upon their rice product. At the very beginning of the program, these four farmers together collaborated with a technical specialist who works in the government, and Dr. Chen rented a 0.5 hectare of an experimental rice paddy in the community to test if the outcome of the yield and profitability under the sustainable farming practice could induce more local farmers to participate in the program. They were hoping to expand the specifications of this program by achieving it. After the first trial phase, they continued this program on the other farmer’s farmland to save the leasing cost, and it was the time when the “Leopard Cat Rice” program officially launched. There was only one participating farmer in this research who was brought

into this program, within six months after this program had started, by another initiator. However, his interview content was not included in this research. Moreover, he is the only participating farmer who had withdrawn from the program and re-joined again.

Although all participating farmers conduct rice cultivation under the “Leopard Cat Rice” program, a program developed with the idea of leopard cat conservation, not all the farmers linked the conservational idea to sustainable agricultural practice. The motivation for them to participate in the program was because of the friendship with Dr. Chen to support them in constructing this program by utilising their farming skills. Dr. Chen recalled in her interviews, “I once accidentally overheard a conversation conducted by the farmers and was surprised to know that none of them actually believed that they could make a profit by planting “Leopard Cat Rice”. They were doing this to support me.” Such a remark from her echoed the opinions I collected from farmers. All participating farmers emphasised that Leopard cat conservation seemed not practical and realistic to them, but the idea of cultivating rice with sustainable farming practice was attractive to them. A farmer shared,

“From the very beginning, I didn’t think too far into the issue of leopard cat conservation. I thought such a huge responsibility could only be shouldered by an expert such as Dr. Chen, but as a farmer, I support the idea to cultivate rice without utilising chemical substances.”

Another farmer also noted, “Because Dr. Chen has been studying leopard cats in the village for many years, I decided to participate in the program after we discussed it.” To these farmers, it did not influence them too much to decide to plant the “Leopard Cat Rice.” According to one participating farmer, “if the rice cannot be sold out, at least I will feel more secure to consume the rice with my family because I know the rice is planted without the utilisation of pesticide and fertiliser.”

### 5.1.2. The modification

From 2014 to 2018, there was no mechanism in the rice production chain in the previous system of the program to ensure whether all farmers were planting the “Leopard Cat Rice” in accordance with the principles of sustainable agriculture. Therefore, Dr. Chen required all of them to acquire the Green Conservation Label with assistance from the employees at TOAF. The purpose of this requirement was to ensure the farming standards of all farmers would pass the inspections that are conducted by the NGO once per year. Thus, all the farmers who participate in the program have the Green Conservation Label. As one participating farmer explained, “I received my Label at the beginning of participating in the



program. I think that TOAF may have come here to promote sustainable farming practice through the relationship with Dr. Chen because there is no application fee applied.” Amongst the participating farmers, there was only one farmer who simultaneously acquired the Green Conservation Label and the Certificate of Organic Farming before he participated in the program. Another farmer had been cultivating the rice with the sustainable farming practice since he participated in the program, but he had never applied for the Label because the rice paddy he cultivated did not belong to him. In 2019, he started farming in his paddy, so he just applied for the label in his second year of the conversion period, with assistance from the social enterprise that now supervises the rice production chain.

### 5.1.3. The source of income

In this research, the main source of income for all participating farmers is not from rice cultivation. Four of them have full-time jobs in the daytime, and there is only one participating farmer who mainly lives off his retirement pension, and he also works as a poultry farmer. Regardless of their income resources, all of them look at the profit they earn from agriculture as extra income. The reason that all participating farmers treat rice cultivation as side income is highlighted by what the technical specialist emphasised,

“If the farmers in the production chain only live off the profit from selling the “Leopard Cat Rice”, they would need to always shoulder the pressure of fluctuating income. Because the production of the “Leopard Cat Rice” can be reduced down to approximately 50%, even though the selling price of the rice is higher than the rice that is cultivated with CF, there is always the concern amongst us that the rice may not be sold out every growing season.”

This answer precisely described the reason why farmers must have another source of stable income, and what he said echoed with another participating farmer who stressed, “Although the yield of the “Leopard Cat Rice” is much less than the rice cultivated with CF, I can still have a stable income because rice cultivation is just my side-line.” In addition, the Chief Operating Officer (COO) from the social enterprise mentioned in the interview, “For a farmer who applies the sustainable farming practice to farm in a paddy that is less than one hectare, his income from agriculture can never cover all the expenses”.

### 5.1.4. Rice cultivation areas

The rice cultivation areas of each participating farmer range from 0.38 to 0.82 hectares. Three of the farmers have different plots of rice cultivation, and there is only one farmer who uses all the plots to plant the “Leopard Cat Rice”. The two remaining farmers

have simultaneously planted the “Leopard Cat Rice” and the rice planted with CF since the beginning of the program, because they want to secure a stable income from the rice cultivation. Compared to CF, the production of the “Leopard Cat Rice” with sustainable farming practice is reduced to half. It would have a huge economic impact on their livelihood if they only planted the “Leopard Cat Rice.” These three farmers are also the ones, amongst five participating farmers, who have expanded the rice cultivation area by renting the farmland from relatives or neighbours after joining the program, but only one farmer expanded it to plant the “Leopard Cat Rice.” The remaining two utilised the expanded plots to cultivate rice with CF. One of the reasons for the expansion was because the supply of the “Leopard Cat Rice” was not adequate during the first year of the program. Increasing the production by expanding the cultivation area is essential. Of these three, there is only one farmer who needs to pay rent to lease the farmland, and the rest have verbally agreed with the landowners to share part of the rice production as rent to them. Amongst these five participating farmers, one of them owns several plots, but he only uses one plot so far to grow the “Leopard Cat Rice”, and the rest remain as the wastelands. He described the reason as,

“Farming is a demanding job, and the farmers have to dedicate a lot to all the work. I am the only one in my family that is still farming now, so no one will help me with it. Therefore, I don’t want to exhaust myself too much.”

Another farmer, who only owns one plot to cultivate the “Leopard Cat Rice”, wanted to have full concentration on taking good care of the “Leopard Cat Rice” without any distraction.

#### 5.1.5. Farming restrictions

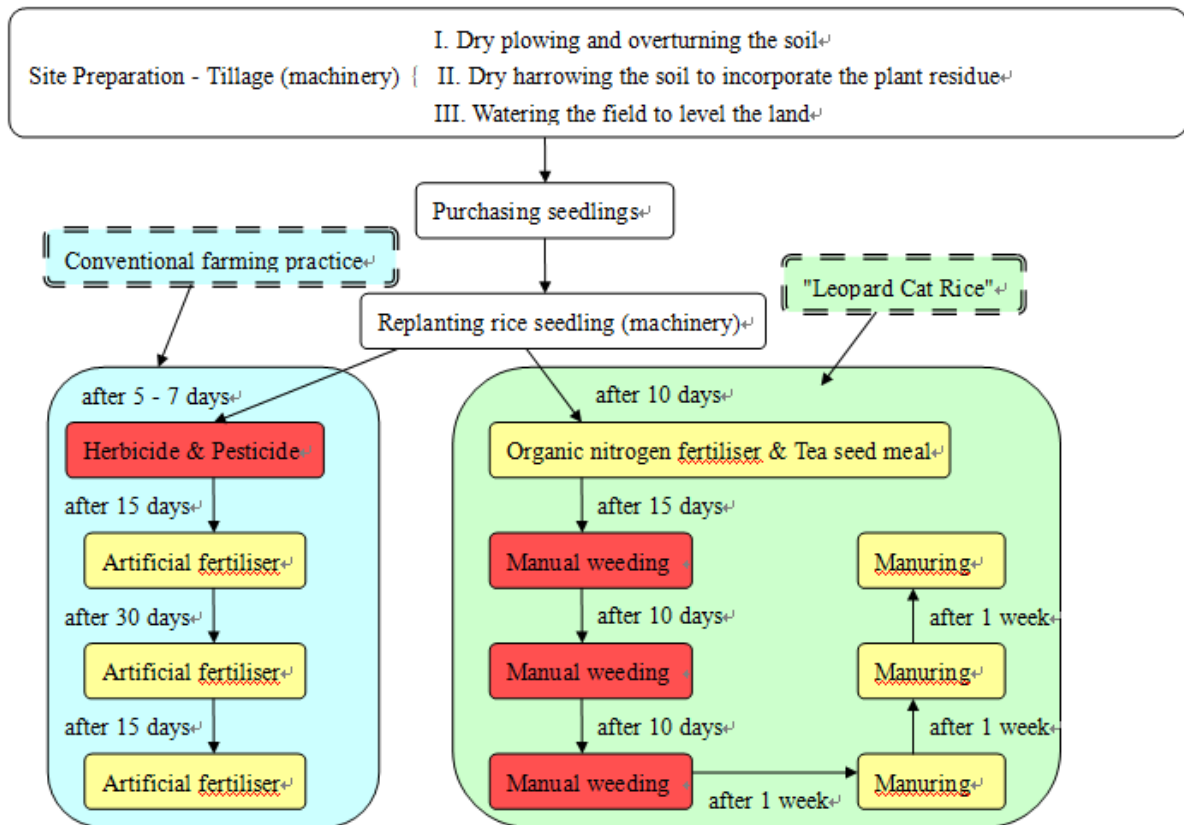
During the interviews, when I inquired about the difficulties of conducting rice cultivation in Fengshuwo Village, all the participating farmers mentioned that the water source is the challenge that bothers them the most. The main reason is the cultivational areas that most of them possess are in hilly and mountainous landscapes, so there are no pipelines from the dam to supply water for agriculture. Consequently, they can only rely on natural ponds, rivers, or groundwater from the private pump stations for crop irrigation. However, the fee to install a pump station is too expensive, which is not cost-effective for farmers if their cultivation areas are not large enough to produce enough rice to sell. Because of that, most farmers would not even consider installing it. One of the participating farmers explained, “The cultivation area I am working on now is under the leasing contract, so I can’t spend extra money to install the private pump station on my rice paddy.” The water supply

from ponds or rivers is unpredictable, and their farming tasks are easily influenced if the precipitation is not consistent. A participating farmer stated, “The source of water for my paddy is from the river. I only cultivated the rice on 0.09 hectares of my farmland, this growth period attributed to the water scarcity this year.”

## 5.2. The conversion of rice cultivation

To produce “Leopard Cat Rice”, participating farmers have to adapt to sustainable farming practices to cultivate their rice to minimise the negative impact followed by their previous CF to cultivate rice on the environment. The changes in rice cultivation practices do not alter the period of rice development, which takes between 140 and 150 days to grow, but the quantity of rice is reduced by about half. A participating farmer noted, “Regardless of how much time and effort you spend on the rice cultivation, as long as it is planted with sustainable farming practice, its production is going to be half than the one with conventional practice.”

According to the farming environment and habits of participating farmers, each participating farmer derives the farming method to adapt to this modification, including the numbers and periods of manual weeding and manure application. Fig.5 shows the comparison of conventional and sustainable farming practices and the standard practices of producing “Leopard Cat Rice” agreed by the participating farmers; the time and numbers of rice cultivation practices are averaged out from their practices. The obvious differences in rice cultivation are the changes from the application of chemical fertilizers and herbicides to manure and manual weeding. Because of the modification, the working days and procedures are increased.



**Fig.5** The comparison of rice cultivation process between the CFs and “Leopard Cat Rice”. The red boxes showed the modifications between these two farming practices  
 Source: Data was collected from the information provided by participating farmers during the interviews (The figure was made by Yun-Yue, Hsu)

The following content describes each step of rice cultivation in detail with the implementation of CF and sustainable farming practice, as well as the differences encountered by participating farmers and their corresponding methods. In the last part of this section, the perception and perspectives of participating farmers towards the differences or difficulties were described in detail.

### 5.2.1. Soil management

The major differences between CF and sustainable farming practices lay in the procedures after the seedlings are planted, so there is no difference in farming procedure during the step of the site preparation (Fig. 5). However, individual farming habits and cognition may create variations in conducting different tasks (Table 2). One participating farmer explained,

“Generally speaking, the rice paddy applied to CF needs to be ploughed about twice before the seedlings are planted, but with sustainable farming

practice, I always increase the times to three or four times to completely release nutrients from the soil.”

However, the rest of the participating farmers did not think the increase of ploughing improves the growth of rice, so they maintained the same number as before the conversion.

**Table 2.** Differences among participating farmers to use methods of rice cultivation to produce “Leopard Cat Rice”

Source: Data was collected from the information provided by participating farmers during the interviews (The table was made by Yun-Yue, Hsu)

	<b>Farmer A</b>	<b>Farmer B</b>	<b>Farmer C</b>	<b>Farmer D</b>	<b>Farmer E</b>
<b>Tillage</b>	√	√	√	Increasing the times of tillage	√
<b>Organic nitrogen fertiliser</b>	√	√	√	Increasing the times of applying organic nitrogen fertiliser	√
<b>+ Tea Seed Meal</b>	√	√	√	GAS eradication mechanically by hand-picking (sometimes)	√
<b>Manual weeding (Employment of labours in hand weeding)</b>	√	Self-weeding	Self-weeding (sometimes)	√	√

### 5.2.2. Nutrient management

Except for weed management, the substances applied under CF and sustainable farming practices to promote rice growth are also different. Under CF, excessive amounts of artificial fertiliser and pesticides are usually used to ensure the stable growth of rice, but with sustainable farming practice, non-hazardous substances are used instead. In the “Leopard Cat Rice” cultivation, agricultural substances the farmers utilise can be divided into organic nitrogen fertiliser and tea seed meal (Fig. 5). In this following part, the implementation of organic fertiliser amongst the participating farmers was described.

During the interviews, one of participating farmers shared his opinions about utilising organic fertilisers.

“Organic nitrogen fertiliser, compared to the chemical one, contains fewer nutrients and takes a longer time to release the nutrient to the paddies. The effect of chemical fertilisers on the rice crops can be detected as soon as it is applied, but to the organic fertiliser, it usually takes three or four days before you notice the efficacy. Meanwhile, we cannot apply too much at once just to enhance the effect because the fertiliser burn could still happen if it’s applied to an excessive amount at once.”

Because of the characteristics of the organic fertiliser, it requires the farmers to apply it with different patterns. One participating farmer remarked,

“Organic fertiliser needs to be applied immediately once the seedlings are planted. According to the different cultivation habits and perspectives of individual farmers, the numbers and intervals of the utilisation may be different, but in general, it would need to be applied four to five times continuously to ensure there is enough nutrient in the paddies for the growth of rice crops.”

In this research, there are four participating farmers who apply it four times per growth duration, and there is only one farmer who increased up to five times (Table 2). Another participating farmer also mentioned the timing and frequency of utilising artificial fertiliser based on his previous experiences, stating “The utilisation of artificial fertiliser only requires three times per growth duration, respectively during the replantation, one month after the replantation, and the phase of flowering.” The impact of organic fertiliser on the environment is minor, compared to artificial fertiliser application, but the participating farmers still have some complaints about it. “The utilisation of organic fertiliser couldn’t deliver 100% of nutrients to develop rice ears which reduce the percentage of ripened grains. This is the reason the rice yields with sustainable farming practices are less than CF.” One of the major reasons for the steep decline in yields is the increased probability of Rice Blast Disease (*Pyricularia oryzae*), a disease caused by fungus that could result in a decreased number of seeds produced by the rice crops (Hashim *et al.* 2019). One participating farmer explained, “Rice cultivated with CF can utilise the chemical products to prevent the occurrence of Rice Blast Disease, but it is unpreventable to us because we are forbidden to utilise the chemicals.” The other participating farmer emphasised the situation that happened in his rice paddy,

“The disease had invaded my rice paddy three times, and it impaired the rice grain filling stage. The worst part was that I could only stand there to witness it spread out in my paddy, and there’s nothing I could do at that moment.”

### 5.2.3. Pest management

According to Halwart (1994), golden apple snail (GAS) eats young and emerging rice crops, so it is harmful to rice development. It has a particularly strong reproductive ability to lay 1,000- 1,200 eggs a month, and the eggs are reared on the rice shoots above the water. Therefore, it's difficult to prevent because it can avoid the foraging of its natural predators living in the water. As for the solution to this issue, one participating farmer noted,

“Even with CF, most farmers now utilise Tea Seed Meal to solve this issue because it is not harmful to plants and mankind. There is a pesticide specifically targeting GAS, but it's very poisonous. Therefore, it has been abandoned by most farmers now.”

From the answer, it can be seen that the utilisation of Tea Seed Meal has become a common practice to tackle the issue, and the data I collected regarding this question also shows that all participating farmers apply this biological control method to their rice paddy. However, one participating farmer had acquired additional support from other sources. He remarked, “There were students who participated in our farming camp coming to my rice paddy to pick up GAS.” Because of this, compared to other participating farmers, this farmer decreased the amount of Tea Seed Meal on the rice paddy.

### 5.2.4. Weed management

The participating farmers all realised that the decrease in rice yields is inevitable, so it was extremely important to ensure the quality of rice to stabilize the sale by acquiring the trust from the end-consumers. Weed management was the key procedure to fulfil their goal. Weeds generally grow faster and stay stronger than rice plants if they both grow at the same period, so it is critical to stunt their growth at the early stage of rice development, when rice grains are too weak to fight for nutrients to grow. One of the participating farmers explained, “When there's a sign showing the weeds start growing, it must be removed immediately. It's to ensure rice could absorb sufficient nutrients to grow in a weed-free environment. The number of times to weed per growth period is around three times, and each time takes several days to finish.” Because the weeds need to be removed manually, each participating farmer has their own way to do this (Table 2). One farmer elaborated,

“I always employ foreign labourers from the factories in the neighbourhood to weed during the weekends, and I usually keep the phone number of the labourers who work diligently to contact them whenever my rice paddy

needs to be weeded again. So far, it's my source of recruitment of employees.”

In this research, four of five participating farmers have been outsourcing this task to the foreign labourers in the neighbourhood, but not all of them hire them every time. One of the participating farmers explained his situation,

“Sometimes I weed it by myself if there are no foreign labours available for hire. It has been getting more and more difficult to hire foreign laborers ever since the pandemic explosion. Because of the travelling ban, there is a shortage of foreign laborers in Taiwan.”

However, one of the participating farmers had assistance in weeding. The farmer noted, “I always weed by myself, but my father helps me sometimes. We just do as much as we can.” Generally speaking, this task can be finished in approximately three weeks depending on the number of the labourers, the size of the rice paddies, the soil condition, and the number of weedings during the growth period. Compared to the prolonged weeding process in sustainable farming practice, weed management under CF only needs to utilise herbicides once in a rice growth period to achieve the same outcome.

#### 5.2.5. The viewpoints towards the conversion

Participating farmers regarded decreased harvesting amount as the biggest difference they confront from participating in the “Leopard Cat Rice” production chain. However, regarding this discrepancy, one participating farmer emphasised, “The yields are indeed a lot less than CF, but farming is not my primary job.” In addition, the other participating farmers remarked, “The harvest amount is relatively small, but the selling price of the rice can compensate for the loss in yields. Overall, I think it's okay.”

Except for the two participating farmers who used to be away from farming practice to work in other counties, the other three farmers all indicated that weed management is the most difficult issue to adapt to in the modification of farming practices. One participating farmer said, “About the weed issue, I still think that the utilisation of herbicide is better than manual weeding because it can inhibit weed seed germination. I can't think of any methods other than manual weeding or the utilisation of herbicide.” Another participating farmer mentioned other issues, but he still feels that the weed issue bothers him the most after comparing the problems. He expressed,



“Because of the requirement of water quality for the acquisition of the Green Label, irrigation water can no longer be taken randomly from any sources. This increases the limitation of our water source because there's already a shortage of water in this region. However, in comparison with the weed issue, weed management is still the most difficult task to tackle.”

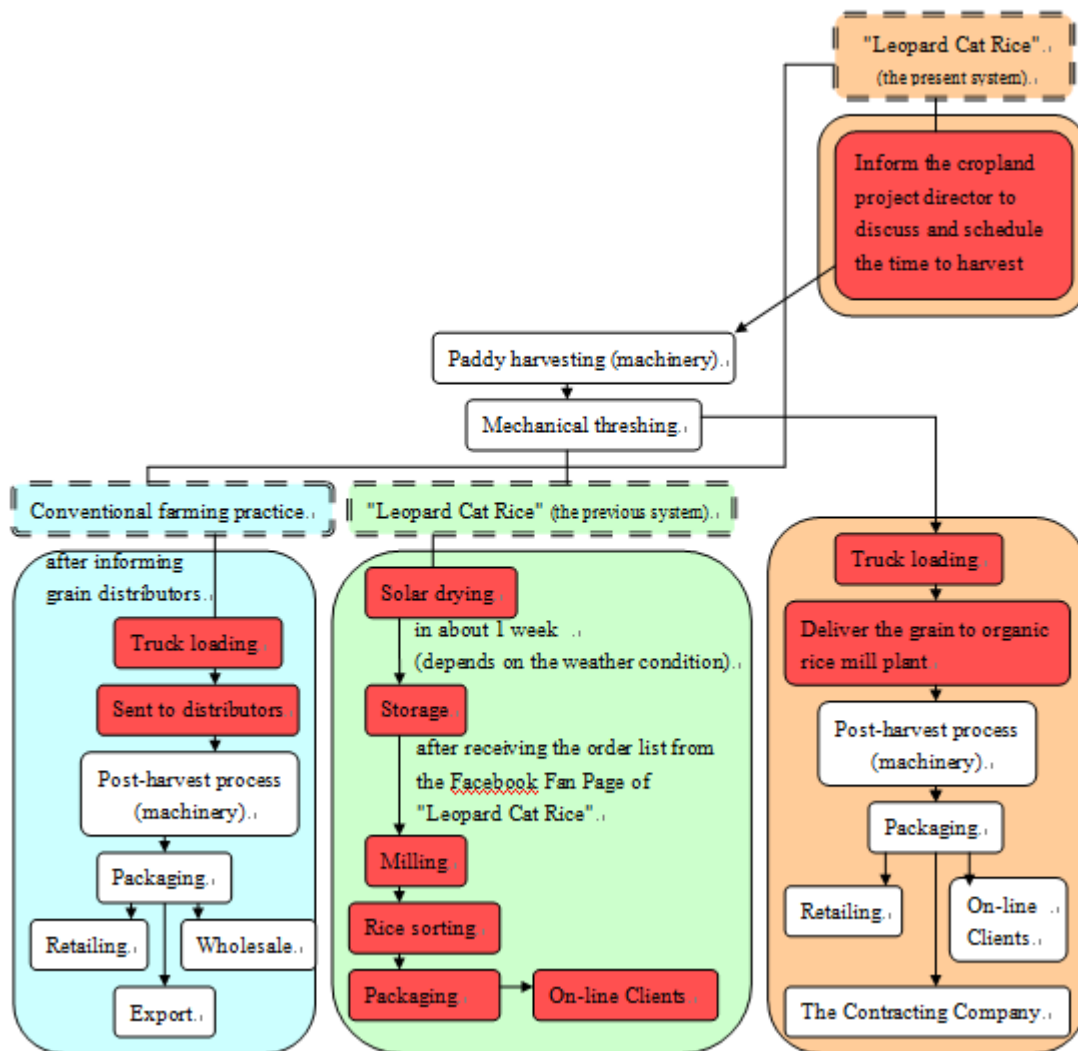
In addition to the weed issue, one participating farmer also stressed another issue that bothered him,

“Not all the cultivated areas in this region apply sustainable farming practices, so the chemical drift from the adjacent rice field could contaminate the rice on my field. This may affect the result of the pesticide residue test on my rice.”

Therefore, for all participating farmers in this research, the farming issues that plagued them the most, because of the farming practice modifications, were weed management, irrigation source, and chemical drift. The farming procedures related to nutrient and pest management did not arouse negative perceptions among them.

### 5.3. Modification of the post-harvest production

To the farmers participating in the program, in addition to the changes in the farming practices, the post-harvest production process has also changed. The post-harvest production has undergone two transformations. The first time is from CF to the previous system of the “Leopard Cat Rice” program, and the second time is between the first and the current system of the program. In this section, the post-harvest production process of these three different modes is described. Furthermore, the participating farmers’ perceptions and opinions of the continuous changes in the past seven years are also described in detail.



**Fig.6** The comparison regarding the procedure of post-harvest and market distribution of rice production. The red boxes showed the tasks that were conducted by the participating farmers. Source: Data was collected from the information provided by participating farmers during the interviews (The figure was made by Yun-Yue, Hsu)

### 5.3.1. The Conventional farming practices

When the rice is to be harvested, conventionally, the farmers contact the people who own combine-harvesters and provide harvesting services to harvest and thresh the rice crops. Normally, individual farmers have one person with whom they have been cooperating and have known for years. So those owners of agricultural machines are not only familiar with the farmer's requirements and preferences regarding harvesting but are able to provide the service once the farmers need it. In this research, all participating farmers have contacts with the service providers. After the rice is harvested, the process of selling the grains is generally standardised in the CF. One participating farmer explained the process, "After harvesting, we usually keep some for our consumption, and sell the rest to the grain distributors." The grain distributors could be private grain companies or the Farmer's Association. The Farmer's

Association is a public-benefit corporation whose operation is supervised by the government to assist farmers in promoting domestic and foreign agricultural product trade. One participating farmer explained the differences between the private grain companies and the Farmer's Association,

“The purchase price of the Farmer's Association is relatively high because they have the social responsibility to ensure farmers' revenue in the agricultural sector. However, there is a fixed quota to purchase the rice crops at a higher price, and the rest is purchased at market prices.”

In Tungshiau Township, there are 15 grain distributors (田邊好幫手, 2021). One participating farmer shared their cooperation relationship with the grain distributors,

“It's not the contractual relationship between us and the grain distributors. We always acquire accurate information regarding the purchase price of rice crops from the harvest service provider and decide which grain distributors we are going to contact. The purchase price is fluctuating between different grain distributors, and we always choose the one with the highest price.”

The other participating farmer elaborated more about the details when cooperating with the Farmer's Association,

“In CF, during the post-harvest production process, farmers usually need to undertake costs and post-harvest losses until the rice crops are delivered to the grain distributors. Meanwhile, farmers also need to pay the fee of a rental truck for the delivery of the grains.”

Four of the participating farmers in this research had previous experiences in collaboration with the grain distributors, including both the Farmer's Association and private grain companies, who have been assisting their families to purchase and sell the grain (Table 3).

There are different processes of post-harvesting to produce and distribute rice regarding variant grain distributors. The Farmer's Association is the sole source for the Taiwanese government to acquire the grain which is used as “public grain”. Before every annual harvest, the government announces the details regarding quantity and the minimum support price (MSP) of the public grain, and farmers who want to join the project need to sell their rice crops labelled as “public grain” to the Farmer's Association during the acquisition period (行政院農業委員會, 2021). The public grain is distributed to the military force and public schools for the support of the National School/Military Meal Programs and is reserved in the public grain warehouse to stabilise the food security in Taiwan. The public consumers usually lack access to the public grain, however whenever an emergency emerges, causing a

shortage of food sources in public, the grain in the warehouse would be distributed to the grain distributors for the market to enhance food security. Yet, the Farmer’s Association also functions as the private grain companies, which purchase the rice crops directly from the farmers to produce the rice and distribute it to the market, such as supermarkets or online food suppliers. Either selling the rice to the Farmer’s Association or the private grain companies, after loading the rice crops on trucks and sending them to the grain distributors, the farmers have fulfilled their responsibility as the basic supplier in the Rice Supply Chain.

**Table 3** Different post-harvesting experiences among participating farmers

Source: Data was collected from the information provided by participating farmers during the interviews (The table was made by Yun-Yue, Hsu)

	<b>Farmer A</b>	<b>Farmer B</b>	<b>Farmer C</b>	<b>Farmer D</b>	<b>Farmer E</b>
<b>The Farmer’s Association</b>	√	√	√	√	×
<b>Private grain companies</b>	√	√	√	√	×
<b>The “Leopard Cat Rice” program</b>	√	√	√	√	√
<b>Individual trading</b>	Not given	√	√	√	×

### 5.3.2. The previous system

The management of the “Leopard Cat Rice” program has gone through two systems, so has the rice production procedure. The previous system required the farmers to function as the primary suppliers, processing agents, and distributors. All participating farmers in this research had joined the early stage of the program, so they had experienced the previous system. Fig. 6 illustrates the tasks they needed to fulfil to sell the rice to end-consumers. One participating farmer noted, “In the previous system, all the farmers participating in the program needed to conduct harvesting, milling, drying and packaging by ourselves.” In the previous system of the program, the structure and framework gave them the freedom to make their own decisions to conduct the post-harvest production, therefore, a different approach had derived from this mechanism. There were two participating farmers who elaborated,

“At the beginning of the previous system, we used to bag the damp rice crops we harvested and carried them manually to the front yards of our houses or the playgrounds in the neighbourhood to solar dry the crops.

Depending on the weather condition and sunlight period, this procedure approximately took up to four or five days to be fulfilled.”

Solar drying is a traditional method of utilising solar radiation to reduce the moisture content from the damp rice crops, and this method requires the farmers to rake the crops every one or two hours to let the crops receive the solar energy evenly. This ensured the quality of the rice's taste. Although it is time-consuming and labour-intensive, all participating farmers expressed, “It’s our most preferable way to dry the rice crops because it makes the rice taste sweeter.” The claim from the farmers echoed the result of research conducted by Aoki *et al.* (2009). They discovered that the shorter wavelength and stronger energy of the UV-A radiation in the sunlight increases the decomposition of protein, by activating enzyme activity in the rice, which creates the depth of rice flavour. The reason the participating farmers chose this method was not entirely to reduce the cost of rice production. All of them emphasised, “If our rice tastes delicious, the customers might be willing to purchase our rice regularly.” The perception reflects that the participating farmers care about the number of sales.

The sales mechanism in the previous system of “Leopard Cat Rice ” is shown in Fig. 7. The Facebook Fan Page was the only access to purchase the rice. Once the customers placed the order online, one farmer would be in charge of the account details and share the names, addresses, and the quantity ordered by customers. The other farmers took turns to receive the order details. The rice crops were stored in the barns of farmers after it was dried by the sun, and the grains were only refined into the rice and sorted when the farmer received the order detail. One participating farmer shared the process,

“Most of us have our small rice millers to operate the dehulling process for our consumption, but it can only process a small amount of the grain. At the beginning of the previous system, we used our millers to produce “Leopard Cat Rice ”, but we then delivered the grains to the rice mill plant after the sales were increasing.”

After the dehulling process, a rice-sorting process is necessary to remove impurities from dehulled rice. One participating farmer recalled the process, “At the beginning of the previous system, we gathered together at one farmer’s front yard to sort the rice manually. We were sorting and chatting together. Good old days back then.” Regarding the emotional expression from this participating farmer when he described the scene, I also received the same response in the interviews with the other three farmers. However, they did not adopt the process of manual sorting for too long. One participating farmer explained,

“We purchased a rice grader with the fund to specifically produce “Leopard Cat Rice” to accelerate the process. However, we started delivering the rice to be sorted in the rice mill after the sales volume of the “Leopard Cat Rice” increased because the demanding amount of rice overloaded the capacity of our rice grader.”

Before shipping the rice to the customers, each participating farmer individually utilised their rice packaging machines to pack the rice in bags that are specially manufactured with the logo and name of the “Leopard Cat Rice.”

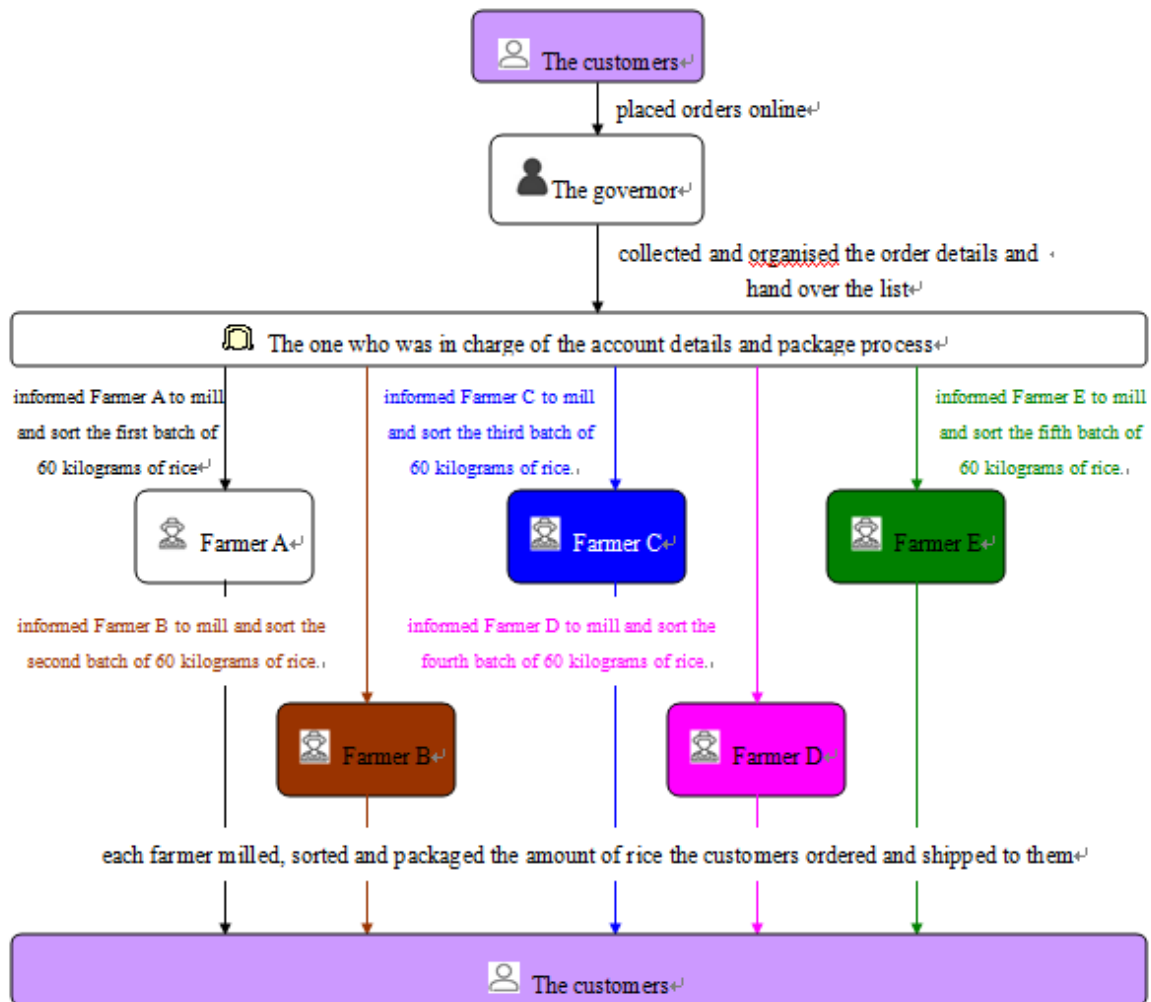
In the previous system of the “Leopard Cat Rice”, each farmer can sell approximately 60 kilograms of rice with the name of the “Leopard Cat Rice” each growth period. If the farmer produced more than 60 kilograms of rice, they needed to sell the rest by themselves, which meant individual trading was allowed, but selling rice with the name of “Leopard Cat Rice ” individually was forbidden. Dr. Chen explained the reason,

“In the first time of the “Leopard Cat Rice” program, the scale of the production chain was not large. Meanwhile, due to the uneven distribution of responsibilities to maintain the functional mechanism, the technical specialist was in charge of most tasks. Because of that, the capacity of the team could only “help” each farmer to sell around 60 kilograms of rice. Therefore, I couldn’t think of any reason to stop them from conducting individual trading if they can sell rice by themselves.”

Moreover, the technical specialist also expressed his opinions regarding individual trading,

“The program was originally established to improve the habitat of leopard cats by the modification of farming practices. We care more about the process of rice cultivation. Thus, we were delighted to see the farmers can manage to sell the rice by themselves.”

The price of selling rice in individual trading could be decided by each farmer, and the production team was not binding on how to formulate the price. In this research, three of the participating farmers had the experience of individual trading, one participating farmer never had the experience, and the other farmer did not provide such information (Table 3).



**Fig.7** The sales mechanism of “Leopard Cat Rice” in the previous system in the program from 2014 to 2018

Source: Data was collected from the information provided by participating farmers during the interviews (The figure was made by Yun-Yue, Hsu)

### 5.3.3. The present system

The program of the “Leopard Cat Rice ” has been supervised by the Bluemagpie Tea Social Enterprise since 2019. The role of the social enterprise in the program functions as a private grain company, so it is responsible for the marketing and distribution of the “Leopard Cat Rice,” and the mechanism operated at this stage is similar to the CF (Fig. 6). Therefore, participating farmers returned to the role as primary suppliers, only focusing on rice cultivation from 2019. The major difference of the present system, compared to the previous system, is the employment of a cropland project director who manages the rice paddies. The director needs to ensure all participating farmers comply with the standard of sustainable farming practices for having complete control of the rice quality. Except for that, he also needs to arrange the schedule for post-harvest production, conduct rice distribution, and provide customer service to end consumers. One participating farmer explained the process

of harvesting, “When the rice is mature enough to be harvested, I will inform the project director to arrange the schedule of the harvesting and post-harvested services.” Most importantly, he acts as a liaison between the farmers and social enterprises to reflect the opinions and issues to each other. Regarding these changes, one participating farmer expressed his opinions,

“The director has just graduated from university, and there are many agricultural procedures and tasks that he doesn’t have basic knowledge of. We are frustrated now that he shoulders the authority to decide the time of the replantation and harvesting for us.”

However, contrary to his opinion, another farmer shared his perspective, “I don’t think he should be the one to bear the blame from us. He just fulfilled his duty as an employee in the social enterprise.” Another farmer seemed to agree with the previous opinion stating, “There was once I gave him the feedback over some issues. We actually made some progress after the coordination.” According to the interviews, there was a complex perception amongst participating farmers towards the establishment of this managerial role.

In the present system, participating farmers are forbidden to conduct the post-harvest production in accordance with the previous pattern. One participating farmer elaborated,

“The social enterprise demands all the processes to follow the standard of producing organic rice, so all the machines we utilise in the production chain have to be organically certified by an organic certification corporation. To meet the standard, the rice crops need to be delivered to the rice mill plant for post-harvest production.”

All processes have been transformed from manual operations in the previous system into machinery operations, and it only takes one day to fulfil the process. Now, the grains are refined at once and are stored in silos to wait for the distribution.

Since the social enterprise started sub-managing the production chain, chemical residue tests have become one of the major modifications. In the interview with the founder of the social enterprise, he elaborated on the mechanism, “Pesticide inspection is conducted in each individual rice paddy per growth period. The process is mandatory. If there is pesticide or chemical residue being tested on the rice crops, we retain the right to refuse to process the entire batch of rice crops from the same farmer.” Except for the modification in the production process, compared to the previous system, farmers are no longer required to sell the rice to end consumers. In this system, all rice crops are collected and delivered to the



rice mill plant for further processes of production, which is the same as the CF. The founder of the social enterprise explained the reason behind this mechanism,

“Before I sub-managed the production chain, there were cases where consumers reported the quality of rice to the Agriculture and Food Agency. Therefore, the strategy of the unified procurement to conduct the post-harvest production is a necessary reform if I want to ensure that the quality of the rice received by end-consumers is consistent.”

In response to the complaints from the customers, during the interview a participating farmer also said, “There were several cases of customer complaints. This might be due to our negligence during the post-harvest production, and we have improved the processes by now.” Over this issue, Dr. Chen also expressed her perspective,

“Part of the occurrence of these complaints might be related to the personality traits of the farmers. Their incautiousness might not notice the details during the processes. However, the products to the end-consumers cannot withstand any flaws. The whole production procedure must be handled with care and caution.”

The rice crops are now purchased from the farmers at a fixed price, and he shared, “We actually reduced the purchase price in 2021 in consideration of the personnel costs, but it’s still one of the highest prices that is offered in the rice market in Taiwan.” Following the process of reduction in the purchase price, one participating farmer described in detail,

“Before he reduced the price, we had a video conference to discuss, but none of the farmers in the production chain agreed with the proposal. Moreover, we proposed to conduct a formal physical meeting because we couldn’t express our opinions clearly with an online meeting. However, he declined. I only realised the reduced price when I delivered the rice crops to the rice mill plant and received the payment.”

Another participating farmer also expressed his perspectives,

“We were guaranteed the lowest purchase price when we were conducting the contract farming. Now, according to his statement, the price is reduced because of the pandemic influence on sales. Regardless of the actual reasons, we should be informed in advance.”

With regard to the participating farmers’ reactions toward the reduction in the purchase price, Dr. Chen shared her opinions, “None of the farmers in the production chain had informed in advance about the price deduction, so they all feel that it leaves them no options to veto the

decision. Of course, they feel upset about it.” Yet, in response to the farmers’ reaction, the founder of social enterprise explained,

“Many local farmers had expressed their willingness to participate in the production chain because of the high purchase price we offer. In fact, I don’t want the farmers who participate in the program just to be induced by the price incentive. Therefore, reducing the purchase price is the strategy to control the farmers’ motivation to join the program.”

The technical specialist provided some information following this issue, “As far as I know, there are some farmers who have been considering withdrawing from the production chain because of this decision.”

In terms of rice retention, the current mechanism also stipulates a certain limit to the farmers. One participating farmer remarked, “We can choose to save 20% of the total rice volume or sell it all to the social enterprise.” The COO of the social enterprise elaborated the regulation, “Regarding the 20% of grain reserves, we don’t mandate the purpose of the usage, but of course, we hope that the farmers save it for self-consumption.” Her statement indicated that individual trading is not strictly banned but is not encouraged. In this research, all participating farmers stated that the individual trading had completely ceased since the social enterprise sub-managed the production chain. In addition, one participating farmer had mentioned that he sold all the rice crops to the social enterprise in 2020. From the process of rice dehulling to the market transaction arrangements, the social enterprise takes full responsibility for the rice trading volume. Now, they are utilising the marketing strategy of luxury agricultural products to expand its distribution channels, so the high-end customers in the boutiques are targeted as their major sales audience. Because of that, another modification they made was to increase the sale price of the “Leopard Cat Rice”, now approximately 2% of the original price. The founder of the social enterprise explained his decision to transform the marketing strategy,

“The public has the myth that locally produced products should have relatively lower sale prices. However, with the low sale price of the products, the locals receive a relatively low income due to the low profit, and the younger generation is even reluctant to build their future in their hometown. The characteristics of low labour productivity in a town make the employment market even worse. All the factors connect closely. Therefore, increasing the sale price of the “Leopard Cat Rice ” to reach the upscale market to reverse the current situation happening in this village is inevitable.”

In this research, there was only one participating farmer aware of the augmentation of the sale price, and he shared, “I know that they have adjusted the sale price, and they said that it was due to the high personnel expenses.” The COO of the social enterprise also shared the information regarding this strategy,

“Currently, the composition of our end-consumer groups has been reshuffled. Only 50% to 60% of our customers are the previous consumers who used to purchase the “Leopard Cat Rice” from the Facebook Fan Page or directly from the farmers. I think it could be attributed to the increased sale price or the scale of individual trading has not been alleviated.”

Except for the upscale consumer groups, the contracted companies are also the other source for distributing the rice. According to the COO, “At current progress, more than 60% of the rice paddies are under the contracting farming system.” Meanwhile, the social enterprise also changed the online platform to sell the “Leopard Cat Rice.” The official website of Taiwan BlueMagpie Tea and other electronic commerce platforms are the major access point to acquire “Leopard Cat Rice”. The original platform, the Facebook Fan Page, has been abandoned by them.

#### 5.3.4. The viewpoints towards the accreditation

In this research, all participating farmers were asked how they learnt of the decision of accreditation. They all indicated that there was a briefing before the official transition. One participating farmer recalled and shared the situation of the briefing and his opinions after the social enterprise started managing the production chain,

“The main purpose of the briefing was to let all farmers know that social enterprise would participate in the program to work with us. During the meeting, he also announced that he would donate partial profits to promote the conservation projects. It has been almost three years now, he has not fulfilled the promise. We had asked him before, and he kept saying that he hasn’t made any profit.”

The other two participating farmers continued this thought, “In fact, no one had expressed any opinions regarding this accreditation. First, no one would venture to show the opposition, and second, we also didn’t have any opposition to voice us.”

As to the question about their perception towards the new system in the program, one participating farmer noted, “There are too many restrictions on the harvesting process, including the time and the machine to harvest. We have lost the freedom to make our own

decisions.” Regarding the regulation that the post-harvest production processes are all outsourced to the same service provider, one participating farmer expressed his frustration,

“He informed us in advance that the harvesting procedure will be processed by the same service provider, but there’s only one reaper to conduct harvesting now, which can only harvest two rice paddies nowadays. Because of that, it’s usually delayed the time to harvest, and it increases the harvest loss.”

Another participating farmer expressed his opinions regarding the transformation stating, “He used to say that all the changes in the managerial strategies induced by the accreditation will undergo gradually, but the situation is that many policies are ambiguous; meanwhile, they never discuss or communicate with us regarding all the changes.”

According to the collision between them, the participating farmers all indicated that they were trying to reverse the relationship with the social enterprise. So, individual farmers took the initiative to have a conversation with him. One participating farmer shared the experience,

“I once told him that we all find it difficult to adapt to these changes, but he told me that those regulations are all mandatory. His response made me feel that we basically lost the ground to voice ourselves in the production chain.”

Another participating farmer also mentioned, “He said that I can just withdraw from the program if I think it’s difficult to adapt to the changes.”

## 6. Discussion

The data I collected from each participating farmer shows that the resistance they generated by staying in the production chain began in 2019, the year when the social enterprise sub-managed the team and the subsequent development of the program took place. The resistance stemmed from the impact on their livelihoods after the changes to the program. Therefore, the first part of this section discusses the reasons behind the transformation from the previous system to the present system. The second part describes the impacts that emerged from the modification. Finally, the relationship between the impact and participating farmers' perception are analysed.

### 6.1. Mechanism defects in the previous system

From 2014 to 2018, with the high exposure of the brand, the “Leopard Cat Rice” program created an opportunity for the public to explore more about the issue. By being involved in the program, the local farmers obtained the chance to acquire the funding to adapt themselves to the sustainable farming technique and improve the quality of their farming area and living environment. In addition, agrotourism provided the participating visitors with a valuable chance to experience the beauty of the farming tradition and practical farming procedures in-depth in a remote village. Meanwhile, the people brought by participating in the event also increased the job opportunities for the locals. However, there are potential problems that hinder the positive outcome of exercising the program: The unbalanced work allocation in the team of “Leopard Cat Rice.”

#### 6.1.1. The constraints

The subjects of this research are all local farmers who possess abundant rice cultivation knowledge and experience, which can be contributed to the construction of the program. However, the age between the participating farmers is relatively high. The causes of ageing populations in farming communities in rural regions is complicated and the empirical research is lacking (Heide-Ottosen 2014). Possible reasons for the ageing population in this research may be: first, an exodus of younger population to cities for the increased employment; and secondly, returning migration of older generations back to their hometowns after retirement. For the first reason, a long-term demographic survey is needed to determine if it is the exact reason for the migration of potential farmers in the younger and middle-aged population in the village. However, the second reason reflects the conditions of the sample in

this research, which is that two out of the five participating farmers had come back to the village continuing their farming profession.

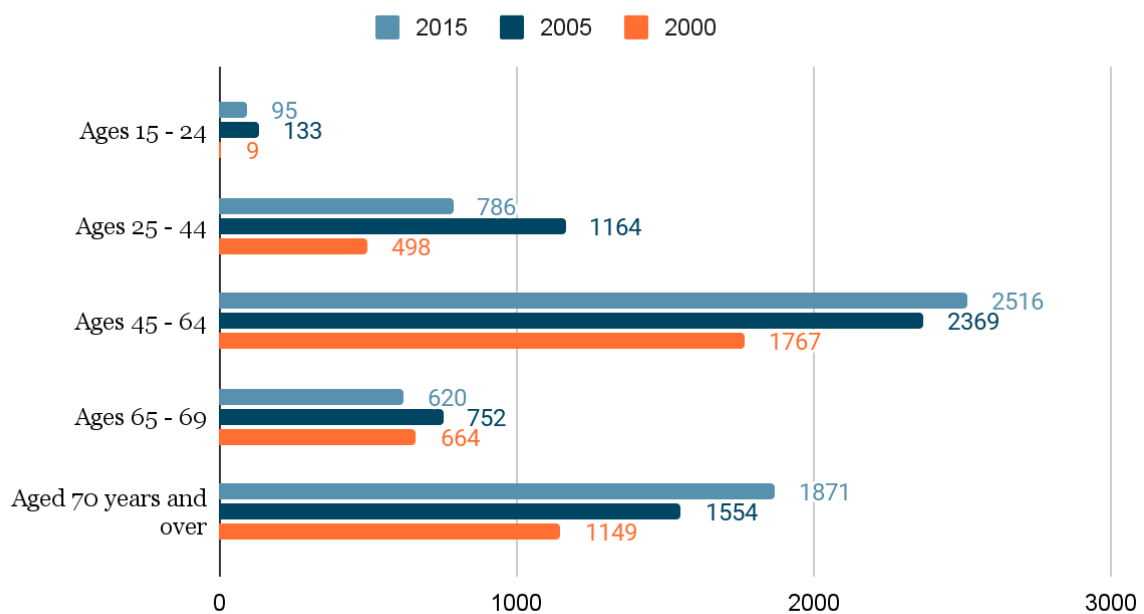
The participating farmers in this research are from around 50 years old to above 70 years old, and with the educational level around primary and lower secondary education. The composition of the farmers reflects farming population structure in their region. Fig.8 shows that for the past 20 years, most of the farming force in Tungshiau township lands in the age group of 45 to 64 years old, and Fig.9 illustrates that the educational attainment of the farming population for the last 15 years is mostly concentrated at the primary level. Such a result shows that the local agricultural population is mostly middle- and elder-aged; also poorly educated. During the interviews with the participating farmers, there were many times they lamented that the farming population in the village has become sparse and aging. Younger generations were unwilling to contribute to the agricultural sector because of the low income. The older generations possess an inadequate academic background, and also have a strong cultural ethic of keeping the ancestral property of the agricultural land allocated by their ancestors. Therefore, they continue to live off farming. However, with the composition of the farming force in the village, it is very difficult to increase the ecological conservation value of the farmland without any incentive or assistance to improve the external image of the community because the inadequacies of the characteristics of the farming force make it difficult to apply for funds or subsidies if they are required fill out application forms. In other words, it is difficult to develop sustainable agriculture to improve the habitats of leopard cats while only depending on the capacity of the local community.

Because of that, during the previous system of the program, the task of applying the funds from the government landed on the technical specialist in the rice production chain. The fulfilment of writing the application form requires the applicant to provide the details such as promotion methods, the expected value or benefits, the further management or maintenance measures, budget estimation, and farming area maps. In addition, after finishing the projects, an implementation report and reimbursement claim for expenses is needed (行政院農業委員會林務局 2018). Overall, the applicant needs to be equipped with the basic academic abilities to understand the wording in the form. Moreover, the process of writing a reimbursement claim requires the applicant to have a proper habit of collecting invoices or receipts, followed by a good descriptive ability to present the spending purpose in detail. These tasks were difficult for the farmers in the production chain. Even if the funds were applied through the Community Development Association as the applicant, the membership

structure of the association is all constructed with farmers in Fengshuwo Village. Therefore, they would not have much ability to finish the application procedure.

In addition to the procedure above, during the application of the Green Label, the applicants must also attach the list of wildlife species in the agricultural areas where this label applies. Such documentation can help TOAF define a certain level of limitations for utilising natural substances on the cultivation areas. Identifying wildlife requires the relevant knowledge and a long period of site inspection, which requires the manpower, equipment and funds. It is a huge scale for field survey, especially as the agricultural areas included in the program have been cultivated for a long time and the ecosystem there has been degrading. The participating farmers in this research all have regular jobs in addition to rice cultivation. All of them conduct farming practice outside the working hours, so it is impossible for them to spend extra time observing the ecology in their rice paddies. Since 2014, the technical specialist in the production chain fulfilled these tasks by utilising the time after he finished the daytime work, but these procedures need to be conducted once per year. Therefore, in 2017 and 2018, he appointed the Miaoli Nature Ecology Society to continue the application procedure to deduct this workload from the team.

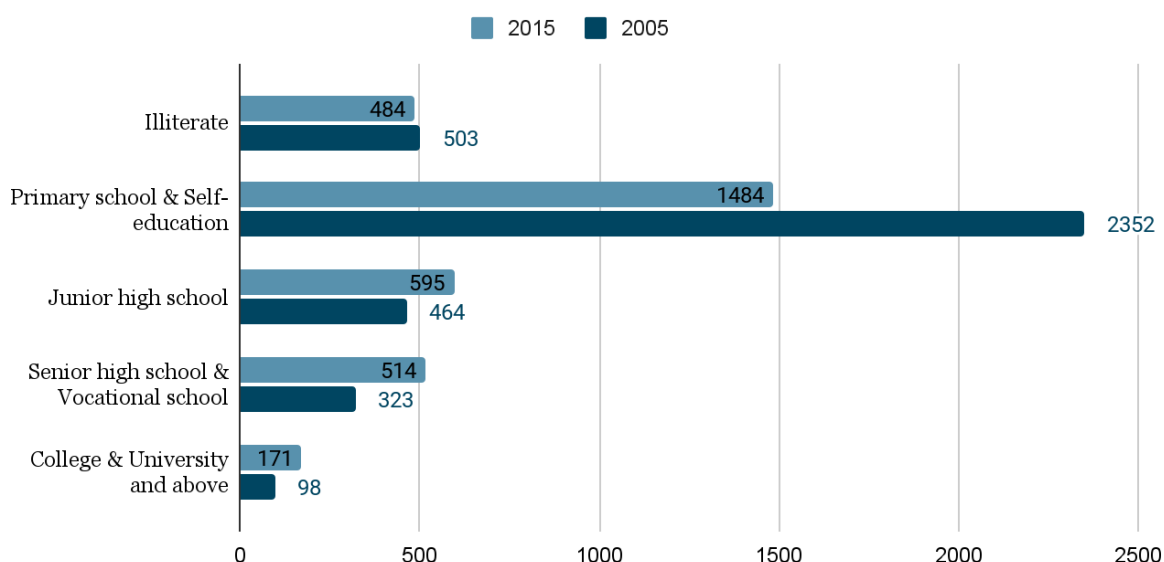
### Age classes of the farming force in Tungshiau Township



**Fig.8** Age classes of the farming force in Tungshiau Township from 2000 to 2015

Source: Data was collected from the website of National Statistics (The figure was made by Yun-Yue, Hsu)

### Population of educational attainment of the farming force in Tungshiau Township



**Fig.9** Educational attainment of the farming force in Tungshiau Township from 2005 to 2015  
Source: Data was collected from the website of National Statistics (The figure was made by Yun-Yue, Hsu)

#### 6.1.2. Capacity development & program promotion

Singh *et al.* (2000) mentioned, in their book, that the capacity of a community to improve themselves is related to the efficiency of a conservation program. Moreover, the natural resources that the community wants to conserve are related to their lives, and to know how to strengthen the community's ability to utilize external resources to stabilise conservation performance by meeting its economic needs is imperative.

In this research, the only way to strengthen the performance of the "Leopard Cat Rice" program is to expand the rice cultivation area. In order to reach the goal, there must be more local farmers in the community who are willing to participate. To attract newcomers into the program, intrinsic incentive growth is imperative. This can be created through increasing "Leopard Cat Rice" sales to increase the profit of farmers in the program. In other words, the economic benefits of the rice sale will be a potential factor for the program's success.

In the "Leopard Car Rice" program, the performance of the sale depends on the ability of marketing. According to Canio *et al.* (2021), consumers have a high desire to buy the products that are produced by producers who support sustainable development. In the previous system of the program, the technical specialist assisted the farmers to conceptualise the goal of the program to the brand image of the "Leopard Cat Rice" and strengthen product reputation by connecting the leopard cat conservation to consumers' purchase behaviour. He



shared leopard cats' images that were captured by the cameras they had set up around the rice paddies. In addition, the progress of the "Leopard Cat Rice" was shared to educate people on the importance of sustainable farming practices for the leopard cat's habitat. The strategy he utilised successfully attracted the public's attention for the leopard cats' survival in Taiwan and created a group of supportive consumers to purchase "Leopard Cat Rice" regularly. This tactical promotion strategy created an unexpectedly positive outcome, but the workload distribution to promote this mechanism meanwhile restricted the quantity of rice they could release to the market and limited the capacity of the brand to expand market reach.

The "Leopard Cat Rice" is a joint-brand in the community, so the marketing and promotion tasks should be conducted by the local farmers. However, during the interviews with the participating farmers, they always emphasised that their tasks in the program are just to conduct rice cultivation. Such an attitude limited their ability to develop relative skills to promote the "Leopard Cat Rice." Thus, in the previous system of the program, because the local community in Tungshiau Township had a relatively weak motivation to explore the construction of the "Leopard Cat Rice" image, all the marketing tasks were only conducted by the technical specialist. The force to promote the brand was limited, so the market reach could not be expanded, which inevitably restricted the possibility of the brand to grow. As a result, the profit the farmers earned could not be an economic incentive to attract more farmers in. Therefore, the program remained a small-scale community program during the first four years.

### 6.1.3. Decentralised power & centralised managerial responsibility

The structure in the previous system of the program was more of an informal partnership, and the operational mode of the program was established based on a mutual trust between farmers, Dr. Chen and the technical specialist. However, there was still the demand for someone to lead the team and ensure the mechanism functioned to promote the brand and make it a model, which could contribute to shift the public's perception toward the positive correlation between land use modification and leopard cat conservation.

The mechanism of the previous system functioned because Dr. Chen took responsibility for the external promotion of the "Leopard Cat Rice". For example, when she was invited to have a speech at schools or firms, she explained the origin and motivation of establishing the program as conceptualising the relationship between land utilisation and leopard cat conservation. The technical specialist was responsible for internal marketing through networking and all administrative processes to support the function of the

mechanism. The farmers in the production chain were playing as fundamental suppliers. The structure of the previous system in the program seemed that each individual stakeholder had their own duties and cooperated seamlessly. However, a functional program that could eventually exert public influence is not only based on the cooperative relationship; the establishment of consensus towards the goal of the program is the key. This pivotal point acquired from the analysis of the data in this research is echoed by the assertion of Moir and Gooden (2019) that the mutual agreement between individual stakeholders on the purpose of partnership to solve collective challenges can help to establish team cohesion.

In the previous system, there was no concern among the farmers about the continuity of the program or the efficiency of the production line. Moreover, because each farmer only took responsibility for the rice they produced and in dealing with individual clients, no one supervised the entire rice production line and packaging process. As a result, no one adopted the opinions from the clients toward their joint cooperation when there were questions and doubts towards the rice quality and chemical residue. Such an attitude from the farmers reflects their confusion towards the role of farmers in the “Leopard Cat Rice” program. They did not have a great understanding of the relationship between the framework and structure of the program and leopard cat conservation. Moreover, they did not seem to realise the survival of the program was based on the actions from each stakeholder, because these had a huge impact on influencing the function of the program. During the interview, there were multiple times they specifically emphasised that they were just "assisting" Dr. Chen to shape the program during the spare time outside of their daily agricultural duties. According to their statement, it can be assumed that they did not project themselves as managers by mastering the corresponding power and sharing the responsibility to educate the public. The confusion in self-identity eventually led to an inequality of responsibility distribution, which played as the main reason that the previous system of the program was not maintained for a long time.

## 6.2. Livelihood implication

The initial modification that participating farmers encounter to be part of the “Leopard Cat Rice ” production chain is the conversion from conventional to sustainable farming practices. This is the mandatory requirement of the program. Conventional agricultural practice, an intensive-type agriculture, is a cultivation method that strongly depends on excessive amounts of fertilisers and synthetic pesticides to catalyse the production (Theocharopoulos *et al.* 2012). This is the mainstream farming practice in Taiwan

(Table 4) due to its characteristic of dense population and scarce arable areas. Compared to the characteristics of the conventional farming practice, the sustainable cultivation practice adheres to the utilisation of natural materials to ensure the food security (Tovey 1997), so the quantity of agricultural products can be reduced up to 60% or 70%, based on the characteristics of different crops. In addition, the rejection of the application of herbicides and pesticides requires many farming procedures to operate manually. For example, farmers may need to remove pests or weed manually to maximise the nutrient intake for the crops. Reduced yields and increased manual farming applications are general concepts of sustainable farming practice among farmers and the public. Therefore, the promotion of the sustainable farming practice has always been difficult to go further in Taiwan, as has been the case in Fengshuwo Village (Table 4).

The next two sections explore both the common perceptions toward the sustainable farming practice, and the decline in rice yields followed by the reduced revenue and the increased workload, to see whether these may influence the livelihoods of farmers in the “Leopard Cat Rice” program.

**Table 4** Variation of agricultural Practices respectively in Taiwan and Fengshuwo Village  
Source: Data was collected from the website of National Statistics (The table was made by Yun-Yue, Hsu)

	<b>Chemical Fertiliser</b>	<b>Synthetic Pesticides</b>	<b>Fertilisers + Pesticides</b>	<b>Sustainable</b>
<b>Taiwan</b>				
<b>2005</b>	57,253 (household) 29,392.77 (hectare)	21,615 (household) 18,560.56 (hectare)	511,851 (household) 398,641.42 (hectare)	248,381 (household) 148,199.98 (hectare)
<b>2015</b>	65,545 (household) 38,610.24 (hectare)	12,985 (household) 8,123.31 (hectare)	504,417 (household) 388,124.29 (hectare)	181,123 (household) 102,209.27 (hectare)
<b>Fengshuwo Village</b>				
<b>2005</b>	847 (household) 294.69 (hectare)	14 (household) 6.53 (hectare)	1,465 (household) 791.65 (hectare)	1,830 (household) 745.79 (hectare)
<b>2015</b>	458 (household) 107.31	14 (household) 4.62 (hectare)	1813 (household) 909.38 (hectare)	1,313 (household) 493.92 (hectare)

	(hectare)			
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### 6.2.1. Conversion & agronomic workload

Sustainable farming may not have as many impacts on farmers as it used to have, because the agricultural system in Taiwan has completely transformed. The sight of farmers rolling up their trousers and standing in the rice paddies to plant seedlings had stayed in the past because of the machinery application on farming. Such a transformation has been attributed to the shortage of farming labour, due to the aging farming population and the middle or younger generation lacking motivation to farm. Generally, farmers cannot afford the cost of purchasing agricultural machinery, so contacting people who provide cultivation services to conduct the farming process has become a norm. Because of that, service providers with agricultural machinery working across different rice paddies are easily seen nowadays. Expressively, Taiwan has entered the era of “Outsourced Rice Cultivation.” Even the government has developed an online platform to unify the data of the population who provides outsourcing services for farmers to let the farmers in demand easily reach the service providers to increase agricultural efficiency (青年農民輔導平台 2020).

In this research, the participating farmers have been dependent on the cultivation service even before they participated in the program. After participating in the program, they continued this cultivation mode to produce the “Leopard Cat Rice”. So, in terms of workload, participating in the program does not impact them much. Although, during the interviews, there were multiple times the participating farmers mentioned the issue of weed management. However, the root cause of this stress is coming from the labourer availability, which is not related to their physical workload. It is worth mentioning that the perception of the participating farmers who conduct weed management by themselves because they did not want to spend extra cost on it. According to Smith (1983), weak weed management could reduce crop yield by up to 80%, which means the income will also decrease relatively. However, reduced income does not seem to motivate the participating farmers to work hard to eliminate the weeds. On the contrary, during the interviews, they emphasised that they only do their utmost to conduct the weed management. One reason that could contribute to their behaviour is that the income from their full-time jobs acts as a safety net to secure the quality of their livelihood.

From the discussion above, with regards to the change in workload, economic drivers seem to have a greater influence on participating farmers' to adapt the sustainable farming practice in this program, and the increased workload due to participating in the program does not seem to have a significant impact on the livelihoods of participating farmers. Therefore, in the next part, the impact of farming expenditures is discussed.

### 6.2.2. Conversion & farm level economic impact

The reduction in rice production at a certain level influences the farmers' revenue, which has become a major obstacle to the development of sustainable agriculture in rice cultivation in Taiwan. However, not all the rice yields had been reduced to 50% yield, as the participating farmers claimed in this research. In Japan, the rice yields conducted by sustainable agriculture reduced by about 10% to 20% (Xie (謝順景) 1993). The drastic reduction in rice yields in Taiwan might be attributed to geographical environment, climate, water sources, and also the farming techniques (Kemp-Benedict *et al.* 2013). Because of this, the Taiwanese government provides many incentives to promote the sustainable agriculture, such as an exemption policy of purchasing natural substances (Hsu (徐永煌) 2016). In this research, the implementation of the "Leopard Cat Rice" program not only responds to the promotion of sustainable farming, but also jumps on the bandwagon of wildlife conservation. Therefore, in fact, the relevant subsidies to support the farmers who participate in this program are quite abundant. As a consequence, the agricultural cost for participating farmers may not be excessively higher than the farmers who conduct CF without any incentives.

Table 5 shows the comparison of the farming expenditure between the previous and present time of the "Leopard Cat Rice" program, with the CF. The data shown in Table 5 are the raw expenditures without deducting the related subsidies they received from the government. Therefore, the actual agricultural cost of the farmers in the program should be lower. The table shows that the largest disparity falls in the process of weed management, which is caused by outsourcing the manual weeding, and this can be reduced by conducting the weeding themselves. However, even so, most participating farmers still decided to outsource this task. In addition, when they first talked about the influence of participating in the program, none of them addressed the agricultural expenditure, which means that this increased expenditure might not affect their agricultural revenue on a large scale.

Furthermore, whether the farmers' revenue is affected by the increased expenditure partially depends on the income from selling the rice. Fig. 6 shows the model of the participating farmer selling the rice varies under different mechanisms. Under the mechanism

of the CF and the present system of the program, participating farmers received the income by selling the grains, so the sales of the rice does not affect their income. In the previous system of the program, participating farmers sold the refined rice to the end-consumers, so the quantity of the sale affected their income. In addition, they had to bear the costs of post-producing the rice. Different sale mechanisms require more detailed information to be inserted and analysed to accurately explore what factors affect farmers' income. This will not be discussed in this research. However, from the data I collected in the interviews, participating farmers had shown their perspectives towards the income they received from these two mechanisms, and their reactions were not entirely negative. Quite contrary, most participating farmers said that the revenue ratio under these two mechanisms of the program are quite similar and in general higher than of the CF. Although the price they obtained by selling the grains to the social enterprise seems to be relatively lower than the price they sell the refined rice to the end-consumers. However, the participating farmers do not need to pay for the post-harvest production anymore. Meanwhile, they also do not have to shoulder the outcome of the rice sale in the current system. In addition, they have spare time to have part-time jobs before they start rice cultivation in the next growth period. Consequently, the overall revenue of the current mechanism in the program is not lower than that of the previous mechanism. In summary, although the conversion to the sustainable farming practice reduces the rice yield, the high sale price of the "Leopard Cat Rice" can offset the production loss for participating farmers. As a result, participating in the "Leopard Cat Rice" program does not have major economic impacts on participating farmers' livelihoods.

**Table 5** Comparison of rice cultivation expenditures between the previous and present systems of the "Leopard Cat Rice" program and conventional farming practice

Source: Data was collected from the information provided by participating farmers during the interviews (The table was made by Yun-Yue, Hsu)

	<b>Conventional agriculture (The first growth period of 2020)</b>	<b>The "Leopard Cat Rice" program (2014 - 2018)</b>	<b>The "Leopard Cat Rice" program (2019 - present)</b>
<b>Land leasing rental</b>	TWD 22,674	TWD 28,000	TWD 28,000
<b>Seedling Purchasing</b>	TWD 10, 647	TWD 8,586	TWD 8,586
<b>Fertiliser/ Manuring (Organic fertiliser + Tea Seed Meal)</b>	TWD 12,651	TWD 16,270	TWD 16,270

<b>Pesticide/ Weeding</b>	TWD 2,622	TWD 38,500	TWD 38,500
<b>Payment to cultivation service (Site Preparation + Replantation + Harvesting + Drying)</b>	TWD 43,207	TWD 33,066	TWD 40,516
<b>Total amount</b>	TWD 91,801	TWD 124,422	TWD131,872

### 6.3. The transformation of perception

Data analysis in social psychology can determine the scale that an individual's performance derived from the decisions is influenced by the others, and it has played an important part in generating the conservation scope of the social science research (Clayton 2013).

From the previous section, results were presented, that the application of the sustainable farming practice, in terms of workload and economics, did not impact the livelihoods of the participating farmers. This includes, to a certain level, the mechanism of the program benefited the farmers regarding the revenue gain. However, in fact, during the interviews with the participating farmers, two of them have already decided to withdraw, and the other two have considered withdrawing. There was only one participating farmer who decided to remain in the program. If participating in the program did not influence their livelihoods, what were the factors that influenced their involvement in the program? In this part, the motivations, perceptions, and perspectives of the participating farmers towards this program were discussed.

#### 6.3.1. The correlation of the value and the attitude

Every organism on this planet is born with its own value in mother nature. This value creates every unique entity, which is called intrinsic value, and makes individual creatures worthy to live (Tylor 1986). Unquestionably, the leopard cat itself possesses the intrinsic value to exist. The existence of the leopard cat made Dr. Chen realise its uniqueness and construct its relational value to her. With this passion, she started the research proactively to

be a leopard cat conservation scholar and extended the enthusiasm in scholarship to develop a community-based conservation program to save it from the crisis of extinction.

Contrary to Dr. Chen, the value of the leopard cat to the local farmers in Fengshuwo Village has always come with the instrumental value, the value to satisfy others' desire (Sandler 2012). The instrumental value of the leopard cat has been derived from the accumulation of local culture, livelihood, and knowledge accessibility. Whether it was the consumptive value of being treated as a rural delicacy, the monetary value of being traded in the black market or the aesthetic value of being poached ignorantly as a decorative display. The existence of the leopard cat has appeared to satisfy the needs of the local residents. Even though the research data has shown that the group size and distribution of the leopard cat has been declining annually, for local residents, they always have had an illusion that its population still remains as it was in early years, because the cases of the cats foraging for chicken are still happening. Therefore, most villagers did not know that the leopard cat has been classified as an endangered species in Taiwan. Participating farmers once said during the interviews the leopard cat has been active around them in the village. They have been told that the leopard cat is a vermin since childhood, because it causes the economic loss of the poultry farmers. Even though not all poultry farmers have experienced economic loss, the leopard cat already has a negative image amongst the locals. Negative perceptions towards the leopard cat have been established and passed on within generations. Such a notion had formulated a stereotype from villagers towards the leopard cat and created an unfriendly atmosphere in its living environment.

The negative perceptions and attitudes toward wildlife may influence them to be more inclined to embrace the strategy of retaliatory killing (Kellert 1980), which is called "Lethal Control" (Cavalcanti et al. 2010; Carter et al 2012). One participating farmer had addressed that one of his relatives used to work as a hunter; and some of them had trapped or captured the leopard cat because of the livestock loss. In this research, most participating farmers have seen the corpses or specimens of the leopard cat either in their neighbours' or friends' houses during their growth. For them, they just legitimately removed wildlife that affected their livelihoods, but the situation they encountered with the leopard cat was unknown to outsiders. Thus, when the public learned of the retaliatory killing conducted in the community, the locals received condemnation from the public. Most people started advocating the establishment of the leopard cat conservation area in their village. The public were imposing the conventional wildlife conservation concept onto the locals and forcing them to follow their lead. Such a domineering performance not only aroused strong backlash from the local



community, but also deepened the resentful attitudes from the locals toward the leopard cat. According to Dr. Chen, there were some warning signs about leopard cat protection on the road that were maliciously vandalised, which had shown that the advocacy of leopard cat conservation from outer counties had triggered furies in the local community.

Zhang and Lei (2012) suggested that the correlation between environmental knowledge and attitude have an extent of influence on the process of enlightenment, and furthermore affect the motivation. The scope of environmental knowledge represents the understanding of the locals to their living environment and their sensitivity to environmental issues (Gandiwa et al. 2014). By far, the negative psychological responses toward both the leopard cat's environmental knowledge or attitude from the local community that coupled with its instrumental value to the locals have induced them to think that it is unnecessary to protect the leopard cat.

### 6.3.2. The motivation & the expectation

Decker et al. (2001) suggested that how people define the value of wildlife can be decisive to the implementation effectiveness of wildlife management. From the previous section, it can be seen that the instrumental value of the leopard cat to the locals had led to a negative impact on its population and distribution. Therefore, giving the positive value of the leopard cat towards community development is vital. In this way, the motivation amongst the locals towards the development of the program can be evoked. The value does not necessarily need to be the profit the locals earn by trading or killing the leopard cat; it can be the rise of employment, the improvement of the locals' livelihood, or the prosperity of the community. In addition, the contribution of the locals towards developing the program to reverse the negative perception can also be another positive value that the leopard cat brings to the local community.

Inferring from the above, the development of the "Leopard Cat Rice" program so far has become a bridge to connect the new four values of the leopard cat to the locals. By far, we can perceive that the awareness of the importance of the leopard cat in mother nature acted as the biospheric motivation to drive Dr. Chen to establish the "Leopard Cat Rice" program. However, to the local community, their motivation was based on the establishment of the four new values. Furthermore, those new values also became their expectations toward the implementation of the program.

### 6.3.3. The structure & the transformation

The previous system's structure of the program enabled all farmers to be on the forefront of disposing of challenges during implementation, such as managing production cost. All participants in the program discussed the solution and made decisions together to solve the dilemmas. Everyone was well aware of the objectives of the program and its future prospects. Although the farmers' motivations for the development of the program were divergent from that of Dr. Chen's, it did not influence their enthusiasm to strive for the growth of the program. During the later phase of the previous system of the program, everyone in the program had targeted the same goal to expand the coverage of the program in the village by improving the mechanisms of the program to attract more local farmers to participate in the program. According to the participating farmers in this research, they were glad to be included in the program and everyone working together as a family to reach the same goal made them feel delighted.

Andrade and Rhodes (2012) suggested that the participatory level is one of the factors determining the success or failure of strategy applied on a protection area because the degree of participation influences the willingness to cooperate. The operating mechanism of the previous system was unquestionably increasing the cohesion in the community and enhancing the willingness of all the participants to cooperate based on the high participatory level. However, as I mentioned in the previous chapters, the neglect of workload allocation led to the accreditation of the management, which induced the transformation in the perceptions of the participating farmers toward the program.

The biggest difference between the previous and present time of the program was the operating mechanism induced by the structure of the program. During the previous system of the program, the participating farmers were in the position to indulge themselves with the power to make decisions for the development of the program. However, they only needed to shoulder the responsibilities as the fundamental producers and focus on the farming practice. At the present system of the program, participating farmers are no longer participating in any decision process; they were forced to act as purely producers in the production chain. Their responsibilities remain unchanged, but the power and the right to voice themselves has been revoked. Amongst the modifications that they could not endorse the most was the addition of the cropland project director who never engaged in agricultural production to supervise their compliance of the farming practices. The foremost point was that none of the participating farmers were involved in the discussion process for adding this position in the production chain. Furthermore, no farmers were informed of this modification before it was formally

implemented. This intensified their dissatisfaction with the management strategy because they felt that the agricultural profession, they had nurtured for a long time was not respected; meanwhile, their existence in the production chain was also ignored. Now, not only do the participating farmers know nothing about the program's trends, but the change in power and position has made them unable to adapt. Therefore, during the interview process, their emotional responses to the current arrangement and management were comparatively intense.

During the interview process, although the participating farmers complained about the flaws of following the post-harvest production process, all participating farmers had spontaneously pointed out that the uncertainty about the trends of the program was what concerned them the most. To the participating farmers, the development of the program was tailor-made for the needs of their community. The vision they wanted to pursue through the program depended on the cooperation and contribution of their community, which had acted as one of their expectations toward the program. Because of this, the high participatory level of their community towards the program was the main reason they had a high-level of recognition to the previous system of the program. Nowadays, due to the modifications in the management strategy, the right for the local farmers to participate in decision making has been completely excluded from the implementation of the project. This is undoubtedly contrary to the main expectations they anticipate from the program. For the participating farmers, this program is the product that was constructed through the cooperation between them and Dr. Chen, so they are supposed to have the right and power to keep constructing its future. If they remain only in the role to comply with all the arrangements of the social enterprise henceforth, it does not necessarily need to be conducted by them. Thus, to the participating farmers, whether they participate in the program or not does not seem to be as critical as it used to be.

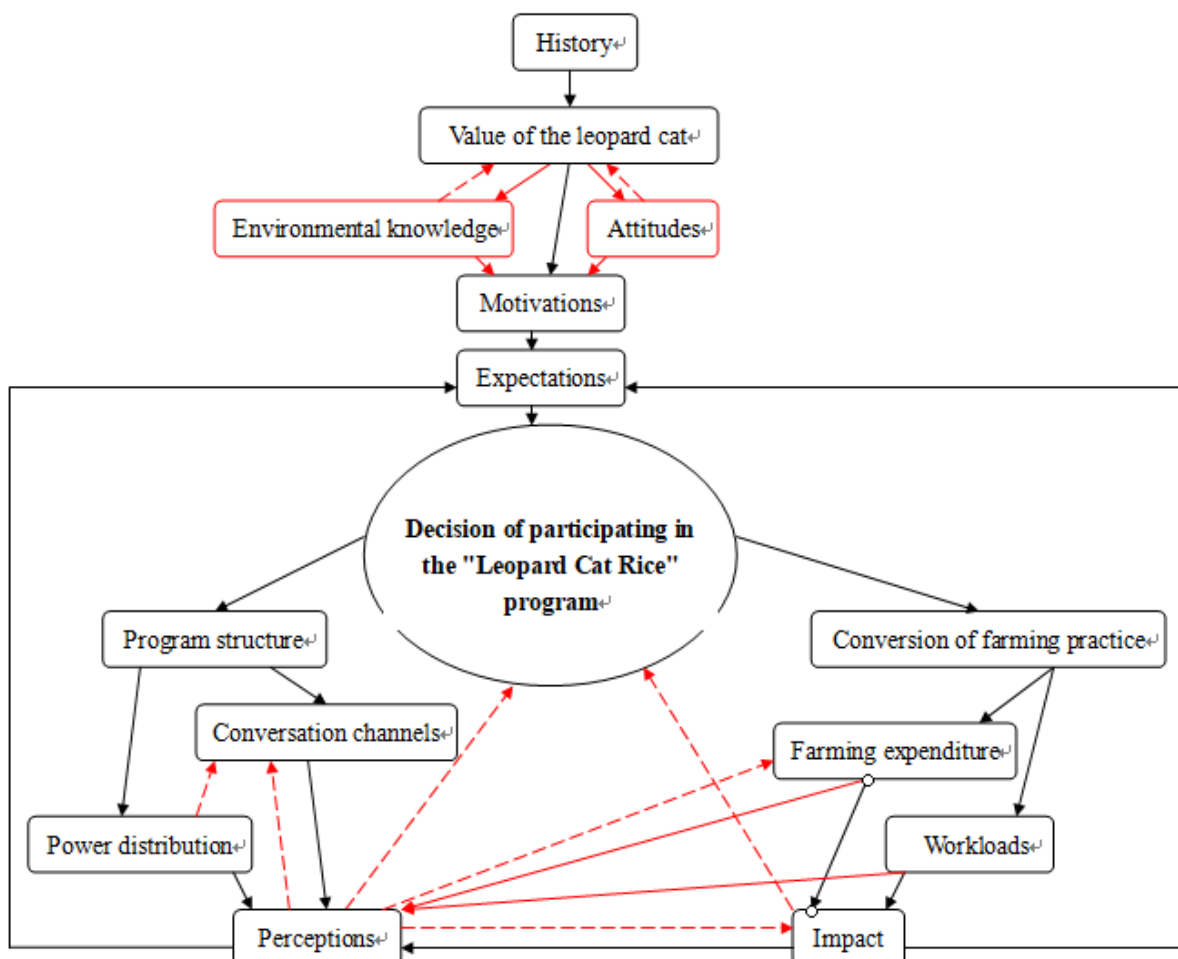
#### 6.4. Summary

Based on the discussion above, the answers to the two sub-questions are presented here. First, we will summarize whether participating in the "Leopard Cat Rice" program had impacts on the livelihoods of the participating farmers. The results compiled based on the data provided by the participants in this research had shown that the system of the "Leopard Cat Rice" actually improved the livelihood of the participating farmers by compensating the extra expenditure from the participating farmers with the increased revenue. It did not

increase the workload on the participating farmers, due to the current overall transformation of agricultural production mechanism in Taiwan.

Second, how are the perceptions of the participating farmers to the “Leopard Cat Rice” program? Taking into consideration the development history of the program, the participating farmers used to have a positive perception toward the program because the implementation had met their expectations. However, the reorganisation of the production chain had centralised the power for the social enterprise and decreased revenue for the participating farmers. Besides, the current sub-management team had failed to actively implement communication channels with the participating farmers. Now, the participating farmers have been showing a negative perception towards the growth of the program.

After all the data analysis and comparison, the connections between different factors and their influence on the participating farmers’ decisions toward participation in the program in the future are shown below.



**Fig.10** Conceptual framework in practice. The red arrows are the ones that were discovered after the data analysis. (The figure was made by Yun-Yue, Hsu)

## 7. Conclusion

This research is an exploratory research, which explored the factors that could possibly influence the participating farmers to participate in a wildlife conservation program. Although the sample size is small, it could still be seen from the interview data that participating farmers' perceptions and considerations towards the program had intermittent changes. The farmers' long-term resentment and hostility towards the predation of the leopard cat on poultry indicated that their initial motivations for the development of the program were based on the relationship with the conservation scholar, rather than leopard cat conservation or habitat improvement. However, it did not affect the promotion of the program. Surprisingly, in the later stage of the previous system, everyone in the program had the same ambitions and goal to build the same vision together. Many researches have often emphasised that participants' motivation induced by the environmental or wildlife value can trigger stronger positive responses from them to participate in the program (Noe et al. 2005; Tourangeau et al. 2020). Quite contrary, it can be seen in this research, that the participating farmers' motivation did not relate to the ecological or wildlife knowledge, but this did not eliminate their desire to participate in the program. Yet, their expectations, which were derived from the motivation to participate in the program, at a large scale, influenced their willingness to conduct the tasks in the program. These expectations were the products of internal communication and discussion during the program' implementation. That is to say, "communication" is the first factor that influenced participating farmers to participate in the program.

The second factor that influenced their willingness to participate was the lower level of participation during the program's implementation. The success of a program depends mainly on the support of all stakeholders in the program, and the level of support can be determined by the familiarity of participants with the goal and the program's future plans. Maintaining a high level of participation among all participants in the program by exposing them to the detail of the implementation policies and the future trend of the program, so that it will generate cohesion in the team, plays a critical role for the success of the program. According to the analysis of the data in this research, the gap between participating farmers' participatory level and expectations could be offset by communication. Therefore, communication and participation are essentially restrained by each other, and neither is indispensable.

To conclude, from the result of this research, the factors that influence the participating farmers to participate in the “Leopard Cat Rice” program was the participation level and communication issue that were attributed to the human-human conflicts during the implementation of the program. In addition, an efficient and effective community-based conservation program should be implemented on the basis of sharing power and responsibilities with a co-management approach, not on the basis of determining rights and responsibilities with a top-down approach.

## 8. References

- Chen, S.-H. 2021. Tungshiau town hall: Industry Overview. Data available online from: <https://www.tungshiau.gov.tw/cp.aspx?n=5678>
- Fang, Y.-J., Shiue, B.-W., Hsieh, C.-K. & Lin, W.-T. 2015. Facilitating biological and freshwater resource conservation by agricultural activities at Gongliao-Hoho-Terraced-Paddy-Fields, Taiwan. Data available online from: [https://satoyama-initiative.org/case\\_studies/facilitating-biological-and-freshwater-resource-conservation-by-agricultural-activities-at-gongliao-hoho-terraced-paddy-fields-taiwan/](https://satoyama-initiative.org/case_studies/facilitating-biological-and-freshwater-resource-conservation-by-agricultural-activities-at-gongliao-hoho-terraced-paddy-fields-taiwan/)
- Focus Taiwan. 2019. Miaoli passes leopard cat conservation bill. Data available online from: <https://focustaiwan.tw/society/201912100024>
- Forestry Bureau. 2019. List of Conservation Wildlife. Data available online from: <https://conservation.forest.gov.tw/0002021>
- IFOAM-Organics International. 2020. STANSARDS & CERTIFICATION: Participatory Guarantee Systems (PGS). Data available online from: <https://www.ifoam.bio/our-work/how/standards-certification/participatory-guarantee-systems>
- IUCN Red List. 2021. Leopard Cat. Data available online from: <https://www.iucnredlist.org/species/18146/50661611>
- Laws and Regulations Retrieving System. 2019. 苗栗縣石虎保育自治條例. Data available online from: <http://law.miaoli.gov.tw/glsnewsout/LawContent.aspx?id=GL000142>
- Laws & Regulations Database of The Republic of China. 2002. Article Content: The 37.5% Arable Rent Reduction Act. Data available online from: <https://law.moj.gov.tw/ENG/LawClass/LawAll.aspx?pcode=D0060008>
- National Statistics - Republic of China (Taiwan). 2021. Agriculture, Forestry, Fishery and Animal Husbandry Census: Statistical Tables. Data available online from: <https://eng.stat.gov.tw/lp.asp?CtNode=1634&CtUnit=784&BaseDSD=7&mp=5>
- Taiwan BlueMapie Tea. 2020. About. Data available online from: <http://www.bluemagpietea.com/about/?lang=en>
- Taiwan Roadkill Observation Network. 2021. Animalia: Prionailurus bengalensis. Data available online from: <https://roadkill.tw/bio-taxon/prionailurus-bengalensis>
- The Executive Yuan Gazette Online. 2017. Directions for Organic and Eco-friendly Farming Subsidies. Data available online from: <https://gazette.nat.gov.tw/egFront/detail.do?metaid=90849&log=detailLog>

Worldometer. 2021. Population: Eastern Asia. Data available online from:

<https://www.worldometers.info/world-population/eastern-asia-population/>

Hsu, Y.-H. (徐永煌) 2016. 通霄人 NO.70.

<https://webws.miaoli.gov.tw/Download.ashx?u=LzAwMS9VcGxvYWQvNDgxL3JlbGZpbGUvMTMwOTcvMjk2NzY3LzRjYjU2Zjg4LTFiODgtNDlkZi1hMTUwLWI4NDJjMGM1NDU0Mi5wZGY%3D&n=ZTFfMzA2LemAmumchOmOruioik5PLjcwLXMucGRm>

Li, J.-H. (李璟泓). 2015. 台灣石虎窩：消逝的石虎.

[https://taiwanleopardcat.pixnet.net/blog/post/305702370\).%E8%A8%98%E9%8C%84%E4%BA%86](https://taiwanleopardcat.pixnet.net/blog/post/305702370).%E8%A8%98%E9%8C%84%E4%BA%86)

Lu, X.-L.(呂欣潑) 2020. 苗栗石虎「中毒體發抖」...癱路邊獲救！農業處證實：縣內首

例. <https://pets.ettoday.net/news/1845784>

阿虎加油. 2021a. 友善石虎農作: 認識農友. <https://ahutw.info/farmers.php?type=0>

阿虎加油. 2021b. 友善農作理念. <https://ahutw.info/ecofarming.html>

通霄鎮公所. 2020. 統計專區：108年苗栗縣通霄鎮統計通報.

[https://www.tungshiau.gov.tw/News\\_Content.aspx?n=5744&s=313139](https://www.tungshiau.gov.tw/News_Content.aspx?n=5744&s=313139)

通霄鎮公所. 2021. 各里介紹: 通霄里. <https://www.tungshiau.gov.tw/cl.aspx?n=6183>

楓樹窩石虎米. 2021.

<https://www.facebook.com/%E6%A5%93%E6%A8%B9%E7%AA%A9%E7%9F%B3%E8%99%8E%E7%B1%B3-776930312326504/>

田邊好幫手. 2021. 糧商. <https://m.coa.gov.tw/FoodBusinessData/Index>

行政院農業委員會. 2021(a). 新聞與公報：公告110年第1期作公糧稻穀收購數量、價格、期限濕穀計價方式

[https://www.coa.gov.tw/theme\\_data.php?theme=publication&id=5258](https://www.coa.gov.tw/theme_data.php?theme=publication&id=5258)

行政院農業委員會. 2021(b). 農業統計資料.

<https://agrstat.coa.gov.tw/sdweb/public/official/OfficialInformation.aspx>

青年農民輔導平台. 2020. 農機代耕媒合平台9月正式上線.

[https://academy.coa.gov.tw/YF/news.php?id=news\\_1598862223](https://academy.coa.gov.tw/YF/news.php?id=news_1598862223)

勞動部. 業務專區: 基本工資制訂與調整經過.

<https://www.mol.gov.tw/topic/3067/5990/13171/19154/>

慈心有機. 2021a. 綠保規範.



<https://toaf.org.tw/conservation/bulletin/standard/690-2017-09-05-03-08-58>

慈心有機. 2021b. 綠色保育. <https://toaf.org.tw/conservation>

- Adams, W. 2015. Conducting Semi-Structured Interviews. Handbook of Practical Program Evaluation. Jossey-Bass. 912 pp.
- Anand, S. & Radhakrishna, S. 2017. Investigating trends in human-wildlife conflict: is conflict escalation real or imagined? Journal of Asia Pacific Biodiversity 10(2): 154-161.
- Andrade, G.S.M. & Rhodes, J.R. 2012. Protected Areas and Local Communities: an Inevitable Partnership toward Successful Conservation Strategies? Ecology and Society 17(4), 16 pp.
- Aoki, H., Sukegawa, K. & Daikokuya, Y. 2009. Effect of Ultraviolet-A Irradiation on the Quality of Harvested Agricultural Products during the Drying Process, Hachinohe Institute of Technology, 4 pp.
- Asimopoulos, S. 2016. Human-Wildlife Conflict mitigation in Peninsular Malaysia: Lessons learnt, current views and future directions. Faculty of Natural Resources and Agricultural Sciences. 71 pp.
- Barlas, Y. 2007. System dynamics: Systemic feedback modeling for policy analysis.
- Bennett, N.J., Roth, R., Klain, S.C., Chan, K.M.A., Christie, P., Clark, D., Cullman, G., Curran, D., Durbin, T.J., Epstein, G., Greenberg, A., Nelson, M.P., Sandlos, J., Stedman, R.C., Teel, T., Thomas, R.E.W., Verissimo, D. & Wyborn, C. 2017. Conservation social science: Understanding and integrating human dimensions to improve conservation. Biological Conservation 205.
- Biernacki, P. & Waldorf, D. 1981. Snowball Sampling: Problems and Techniques of Chain Referral Sampling. Sociological Methods & Research 10: 141-163.
- Boyatzis, R. 1998. Transforming qualitative information: Thematic analysis and code development. SAGE. 184 pp.
- Carter, N.H., Riley, S.J. & Liu, J. 2012. Utility of a psychological framework for carnivore conservation. Oryx 46: 525-535.
- Canio, F.D., Martinelli, E. & Endrighi, E. 2021. Enhancing consumers' pro-environmental purchase intentions: the moderating role of environmental concern. International Journal of Retail & Distribution Management.
- Cavalcanti, S.M.C., Marchini, S., Zimmermann, A., Gese, E. & Macdonald, D. 2010.

- Jaguars, Livestock, and People in Brazil: Realities and Perceptions Behind The Conflict. Oxford University Press. p.383-402.
- Chen, M.-T. 2014. Initiating Community-involved Conservation Activities for Endangered Leopard Cats in Miaoli, Taiwan. Hsinchu Forest District Office, Forestry Bureau, Council of Agriculture, Executive Yuan. 125 pp.
- Chen, M.-T., Liang, Y.-J., Kuo, C.-C. & Pei, K. J.-C. 2016. Home ranges, movements and activity patterns of leopard cats (*Prionailurus bengalensis*) and threats to them in Taiwan. The Mammal Society of Japan 41: 77-86.
- Chen, M.-T. 2008. Present Status and Conservation of Small Carnivores at Low Elevation Mountains in Shinchu County and Miaoli County (3/3). Research Project on Conservation Series No. 96-01 of Forestry Bureau, Council of Agriculture, Executive Yuan., 103 pp.
- Chen, M.-T. 2014. Initiating Community-involved Conservation Activities for Endangered Leopard Cats in Miaoli, Taiwan. Hsinchu Forest District Office, Forestry Bureau, Council of Agriculture, Executive Yuan. 125 pp.
- Chen, M.-T., Liang, Y.-J., Kuo, C.-C. & Pei, K. J.-C. 2016. Home ranges, movements and activity patterns of leopard cats (*Prionailurus bengalensis*) and threats to them in Taiwan. The Mammal Society of Japan 41: 77-86.
- Chiang, P.J. 2007. Ecology and conservation of Formosan clouded leopard, its prey, and other sympatric carnivores in southern Taiwan. The faculty of the Virginia Polytechnic Institute and State University. 137 pp.
- Chiang, P.J., Pei, K., Vaughan, M.R. & Li, C.-F. 2012. Niche Relationships of Carnivores in a Subtropical Primary Forest in Southern Taiwan. Zoological Studies 51(4): 500-511.
- Chiang, P.J., Pei, K., Vaughan, M.R. & Li, C.-F. 2014. Is the clouded leopard *Neofelis nebulosa* extinct in Taiwan, and could it be reintroduced? An assessment of prey and habitat. Oryx 49(02).
- Clayton, S., Litchfield, C. & Geller, E.S. 2013. Psychological science, conservation, and environmental sustainability. Frontiers in Ecology and the Environment 11(7): 377-382.
- Decker, D.J., Brown, T.L., Vaske, J.J. & Manfredi, M.J. 2001. Human Dimensions of Wildlife Management. The Wildlife Society.
- Gandiwa, E., Zisadza-Gandiwa, P. & Never, M. 2014. Local People's Knowledge and Perceptions of Wildlife Conservation in Southeastern Zimbabwe. Journal of Environmental Protection 5: 475-481.

- Halwart, M. 1994. The golden apple snail *Pomacea canaliculata* in Asian rice farming systems: Present impact and future threat. *International Journal of Pest Management* 40(2): 199-206.
- Hashim, I., Mamiro, D., Mabagala, R.B. & Tefera, T. 2019. Reduction of initial occurrence of rice blast (*Pyricularia oryzae*) inocula on seeds by microbial and hot water seed treatments. *Australian Journal of Crop Science* 13(02): 309-314.
- Heide-Ottosen, S. 2014. The ageing of rural populations: evidence on older farmers in low and middle-income countries. *HelpAge International*. 24 pp.
- Hollings, C.S. 2001. Understanding the Complexity of Economic, Ecological, and Social Systems. *Ecosystems* 4: 390-405.
- Izawa, M., Doi, T., Nakanishi, N. & Teranishi, A. 2009. Ecology and conservation of two endangered subspecies of the Leopard cat (*Prionailurus bengalensis*) on Japanese islands. *Biological Conservation* 142(9): 1884-1890.
- Kano, T. 1929. The distribution and habit of mammals of Formosa (1). *Zoological magazine* 41:332- 340.
- Kijprayoon, S., Tolieng, V. & Chaicharoenpong, A.P.C. 2014. Molluscicidal activity of *Camellia oleifera* seed meal. *ScienceAsia* 40(6): 393
- Karanth, K.U. & Madhusudan, M.D. 2002. Making parks work: Mitigating human-wildlife conflicts in southern Asia. *Island Press*: 250-264.
- Kellert, S.R. 1980. American attitudes toward and knowledge of animals: An update. *International Journal for the Study of Animal Problems* 1(2): 87-119.
- Kemp-Benedict, E., Barron, J., Vetter, S., Yengoh, G.T. & Fielding, M. 2013. Sustainability implications of Closing the Yield Gap. *Swedish International Agricultural Network Initiative (SIANI)*
- Lee, M.-J., Song, W. & Lee, S. 2015. Habitat Mapping of the Leopard Cat (*Prionailurus bengalensis*) in South Korea Using GIS. *Sustainability* 7: 4668-4688.
- Lee, C.Y. 2015. Application of the scat detection dog in the conservation of leopard cats in Taiwan. *Institute of Wildlife Conservation, National Pingtung University of Science and Technology*, 91 pp.
- Lin, Y.-X., Fang, Z.-P., Lin, G.-F., Zhuang, S.-S., Qian, Y.-H., Li, Y.-C. & Huang, M.-Y. 2016. Population Status and Conservation of Leopard cat (*Prionailurus bengalensis chinensis*) in Nantou Area (2/2). *Research Project on Conservation Series No. 103-05 of Forestry Bureau, Council of Agriculture, Executive Yuan.*, 117 pp.

- Miao, L. 2017. Population Genomics and Evolutionary History of the Leopard Cat (*Prionailurus bengalensis*). Sun Yat-Sen University.
- McCullough, D. R. 1974. Status of Larger Mammals in Taiwan: A Report to World Wildlife Fund, Washington, DC & Tourism Bureau, Ministry of Communications, Taiwan. Tourism Bureau, Taipei, 36 pp.
- Moir, F.C. & Gooden, J. 2019. Consensus, clusters, and trade-offs in wildlife-friendly ranching: An advance analysis of stakeholder goals in northern Mexico. *Biological Conservation* 236: 443-451.
- Nagamichi, K.M. 1940. A monograph of the Japanese mammals. The Sanseido Co. Ltd., Tokyo, Japan.
- Noe, E., Halberg, N. & Reddersen, J. 2005. Indicators of Biodiversity and Conservational Wildlife Quality on Danish Organic Farms for Use in Farm Management: A Multidisciplinary Approach to Indicator Development and Testing. *Journal of Agricultural and Environmental Ethics* 18(4): 383-414.
- Noy. 2008. Sampling Knowledge: The Hermeneutics of Snowball Sampling in Qualitative Research. *International Journal of Social Research Methodology* 11(4): 327-344.
- Pei, K. 2004. Present status of larger mammals in Kenting national park and their conservation concerns. *Taiwan Journal of Forest Science* 19(3): 199-214.
- Robinowitz, A. 1988. The clouded leopard in Taiwan. *Oryx* 22: 46-47.
- Rubin, H.J. & Rubin, I.S. 2011. *Qualitative Interviewing: The Art of Hearing Data*. SAGE Publications, Inc. 288 pp.
- Sandler, R. 2012. Intrinsic Value, Ecology, and Conservation. *Nature Education Knowledge* 3(10): 4
- Singh, S., Sankaran, V., Mander, H. & Worah, S. 2000. *Strengthening Conservation Cultures: Local Communities and Biodiversity Conservation*. UNESCO. 220 pp.
- Shen, M.-Y. 1894. *Gazetteer of Miaoli Country*.
- Smith R.J. 1983. Weeds of major economic importance in rice and yield losses due to weed competition. *Proceedings of the Conference on Weed Control in Rice; 1981 Aug 31–Sept 4; Los Banos, Philippines: IRRI; p. 19–36*
- Theocharopoulos, A., Aggelopoulos, S., Papanagiotou, P., Melfou, K. & Papanagiotou, E. 2012. Sustainable Farming Systems vs Conventional Agriculture: A Socioeconomic Approach. *Sustainable Development - Education, Business and Management - Architecture and Building Construction - Agriculture and Food Security*. IntechOpen.
- Tovey, H. 1997. *Food, environmentalism and rural sociology: on the organic farming*

- movement in Ireland. *Sociologia Ruralis* 37: 21-37.
- Tourangeau, W., Lamarque, M., Greenland-Smith, S. & Sherren, K. 2020. Beyond intrinsic: a call to combine scales on motivation and environmental values in wildlife and farmland conservation research. *Human Dimensions of Wildlife* 26(4).
- Torkar, G., Zimmermann, B. & Willebrand, T. 2011. Qualitative Interviews in Human Dimensions Studies about Nature Conservation. *Varstvo Narave* 25: 39-52.
- Taylor, P.W. 1986. *Respect for Nature: A Theory of Environmental Ethics*. Princeton University Press. 360 pp.
- Young, J. & Rose, D.C. 2018. A methodological guide to using and reporting on interviews in conservation science research. *Methods in Ecology and Evolution* 9(1): 10-19.
- Zhang, H. & Lei, S.L. 2012. A structural model of residents' intention to participate in ecotourism: The case of a wetland community. *Tourism Management* 33.
- Chen, M.-T. (陳美汀). 2017. Survey and conservation plan of the leopard cat ethnic group in Taichung area in 2015 (105年度臺中地區石虎族群調查及保育計畫). 台中市政府農業局. 81頁
- Li, Y.-J.(李運金) 2020. Investigation on the number and distribution of the leopard cat ethnic groups in Miaoli County (「苗栗縣石虎族群數量與分布調查」)委託專業研究調查服務案. 苗栗縣義勇消防總隊協會.
- Horikawa, Y. 1932. *Illustration of Taiwanese Mammals (臺灣哺乳動物圖說)*. 台灣博物學會出版部, Taiwan
- Wang, C.-M. 1992. *Zoological Study on Kashe Stram of the Choshui River System, Central Taiwan*. 台灣省農林廳林務局保育系列研究 83-03號
- Wang, Y.(王穎) 1986. Investigation on the Utilisation of Wild Animal Resources by Restaurants in Taiwan(台灣地區山產店對野生動物資源利用調查(I)). 農委會. 75年農委會生態研究第 11 號.
- Xie, S.-C.(謝順景) 1993. *Research and Extension of Sustainable Agriculture in Countries in the World (世界各國之永續農業研究與推廣)*. 永續農業研討會專輯: 19-45.
- 台灣總督府警務局理蕃課. 1937. 高砂族調查書:第二編、生活. 台灣總督府警務局理蕃課.

Zhang, Y.-C. (張育誠), Wu, J.-Q. (吳佳其), Zhang, Y.-Q. (張毓琦), Lin, J.-H. (林佳宏).

2019. Survey of the leopard cat Ethnic Groups in Taichung Area and Evaluation of Improvement of the Leopard Cat's Important Habitats and Corridors.(107年度台中地區石虎族群調查及石虎重要棲地與廊道改善評估). 社團法人台灣石虎保育協會, 160 pp.

行政院農業委員會林務局. 2018. 社區林業計畫作業規範. 林保字第1081700596號.

## 9. APPENDIX

### Interview guide for participating farmers

#### Interview Guide (local farmers)

Time: \_\_\_\_\_

Interview Platform: \_\_\_\_\_

Interviewee: \_\_\_\_\_

Cultivated Area: \_\_\_\_\_

#### Introduction & Purpose of the interview:

Good afternoon, Mr. \_\_\_\_\_, I sincerely appreciate that you are willing to take part in my research work by joining this interview process as an interviewee. As a graduate student who is located in Norway now but trying to understand the status of implementation of leopard cat conservation programs in Taiwan, I am sure that your opinions and answers to my questions will help me to gain valuable insight into this field.

The purpose of my research is trying to understand the impact of the leopard cat conservation program (farming practice) toward the local farmers' livelihood. Before we start the interview, I would like you to understand that the need of the audio-recording throughout the whole interview is necessary for the further transcribing, however you can turn off the camera if you don't feel comfortable to let it on. I will be the only one who has access to the audio files, and these files will only be used in my research work. In addition, all the audio files will be deleted once I finish my paper. In the transcript of interviews, all the participants will be written down or mentioned in the paper anonymously. Apart from these, all the interviews in my research work will be conducted separately as individual interviews, which means no one else besides the participants would know the content of the interview, so you can be free to convey yourself thoroughly. During the process of answering my questions, you have the right of refusal whenever you don't feel comfortable to answer.

If you all understand and agree with what I mentioned above, we may begin with the interview and recording.

#### 1) Farmer's characteristics

- a) So far, how long have you been farming in Fengshuwo Village ?
  - i) Follow up: how long have you been farming in the rice paddies where you are growing the "Leopard Cat Rice"?
- b) What were the reasons for you to start farming in the first place?
- c) Have you always been conducting rice cultivation since you started farming?  
If not, what else have you ever grown?
- d) Do you conduct the farming practice on all of your arable lands? If yes, what types of the crops you cultivate there? If not, are they all wastelands? and why did you not want to conduct farming practices there?
- e) Are all the arable lands where you already own since the beginning of the farming? Or are they the farming areas you acquired afterwards?
- f) How did you acquire the farming areas where you grow the "Leopard Cat Rice"?

- i) Follow up: Could you please tell me the size of farming areas?
- ii) Follow up: What are the locations of the farming areas?
- iii) Follow up: What kinds of the farming certifications or labels you currently have for the rice paddies where you grow the “Leopard Cat Rice”?
- iv) Follow up: Have you ever increased or decreased the farming areas to cultivate the “Leopard Cat Rice”? If yes, why?
- g) Could you please tell me the rice varieties of the “Leopard Cat Rice” you are currently planting?
- h) Is the farming practice your only source of income?
- i) What are the difficulties for rice cultivation in the areas where you are currently growing right now?
  - i) Follow up: Was the occurrence of the leopard cat part of the difficulties to conduct farming in your farming areas? If yes, which methods have you ever utilised to eliminate the impact of its occurrence onto your farming areas?
  - ii) Follow up: Do you think the methods you have applied are effective?

## **2) Rice cultivation of the “Leopard Cat Rice”**

- a) When did you participate in the program?
- b) How did you know the information to participate in the program?
- c) Why did you decide to be part of the rice production chain?
- d) Compared to your previous farming practice, how different is it to conduct the rice cultivation in the “Leopard Cat Rice” program?
- e) You had mentioned the difficulties to conduct the rice cultivation in the farming areas where you are currently farming now. Do all these difficulties remain the same or changed after you applied the sustainable farming practice? How?
- f) What are the significant and visible changes in your cultivation areas where you are currently planting the “Leopard Cat Rice”?
  - i) Follow up: How do you feel to see these changes?
- g) Have you changed the way you view the impact of the farming practice towards the environment after you participated in the program? If yes, how? If not, why?

## **3) Post-harvest production processes**

- a) Could you please elaborate the post-harvest production processes before you participate in the “Leopard Cat Rice” program?
- b) What are the post-harvest production processes now?
  - i) Follow up: Does it have any changes, compared to the previous system of the “Leopard Cat Rice” program? Why?
  - ii) Follow up: In your own perspectives, what are the biggest modifications amongst them? Why?
  - iii) Follow up: How do these modifications influence you?



- c) Has the quantity of the “Leopard Cat Rice” been changed, compared to the previous systems of the “Leopard Cat Rice” program?
  - i) Follow up: If yes. In your own perspectives, could you think of any possible reasons for the changes?
- d) In your own perception, are you satisfied with the profit you earn now? Why?

**4) Reflection**

- a) Do the participation of the “Leopard Cat Rice” program affect you? How?
- b) With the experiences of working in the program, what are your opinions towards the implementation of the program?
- c) Do you think the implementation of the “Leopard Cat Rice” program is beneficial for leopard cat conservation? If yes, how? If not, why?
- d) What is your future plan regarding participating in the program?

# Interview guide for leopard cat conservation scholar

## Interview Guide (the leopard cat conservation scholar)

Time: \_\_\_\_\_

Interview Platform: \_\_\_\_\_

Interviewee: \_\_\_\_\_

### Introduction & Purpose of the interview:

Good afternoon, Mr./Miss. \_\_\_\_\_, I sincerely appreciate that you are willing to take a part in my research work by joining this interview process as an interviewee. As a graduate student who is located in Norway now but trying to understand the status of implementation of leopard cat conservation programs in Taiwan, I am sure that your opinions and answers to my questions will help me to gain valuable insight into this field.

The purpose of my research is trying to understand the impact of the leopard cat conservation program (farming practice) toward the local farmers' livelihood. Before we start the interview, I would like you to understand that the need of the audio-recording throughout the whole interview is necessary for the further transcribing, however you can turn off the camera if you don't feel comfortable to let it on. I will be the only one who has access to the audio files, and these files will only be used in my research work. In addition, all the audio files will be deleted once I finish my paper. In the transcript of interviews, all the participants will be written down or mentioned in the paper anonymously. Apart from these, all the interviews in my research work will be conducted separately as individual interviews, which means no one else besides the participants would know the content of the interview, so you can be free to convey yourself thoroughly. During the process of answering my questions, you have the right of refusal whenever you don't feel comfortable to answer.

If you all understand and agree with what I mentioned above, we may begin with the interview and recording.

### 1) The background

- a) So far, how long have you devoted yourself to the leopard cat conservation field?
  - i) Follow up: What were the reasons making you decide to work in this field?
- b) What do you do regarding the leopard cat conservation tasks?
- c) When did you establish the NGO to conduct the conservation tasks?
  - i) Do you acquire extra assistance in conducting the leopard cat conservation tasks?
  - ii) What does the NGO do to promote leopard cat conservation in Taiwan?
  - iii) In terms of your own perspectives, which part is the most difficult to promote leopard cat conservation in Taiwan?
- d) What is the role of the NGO regarding the conflicts between the leopard cat and the local villagers in Tungshiau Township?

## **2) The development and promotion of the “Leopard Cat Rice” program**

- a) Why did you want to establish this program?
  - i) Follow up: Was the development of this program inspired by other wildlife conservation programs overseas?
- b) What role have you been playing in shaping this program?
- c) How did you convince the local farmers to support the development of this program?
  - i) Follow up: Were there any difficulties you encountered to persuade the local farmers to be part of the program?
  - ii) Follow up: Were there any difficulties you encountered to promote this program to the public?
- d) Were there any extra external assistance to support the development and implementation of the program?
- e) How do you reckon the benefit of participating farmers by joining this program?
- f) Why did you decide to let the social enterprise sub-manage the program?
  - i) Follow up: Why the “Bluemagpie social enterprise”?
  - ii) Follow up: Are you still being part of the program, personally?
  - iii) Follow up: What are the opinions you received from the participating farmers regarding the accreditation?
- g) In terms of your own perspectives, is the implementation of the program still following your expectations or principles?
- h) How do you feel about the reorganisation of the implementation of the program now?
- i) In terms of your own perspectives, does the establishment of the program benefit leopard cat conservation?
  - i) Follow up: How does the program influence people’s perceptions and perspectives on leopard cat conservation?

## **3) The issues of the leopard cat conservation**

- a) In The news from a few years ago, one governor had mentioned that the increasing number of the leopard cat road kills is due to the increase in its population, which means the leopard cat conservation campaign is not as urgent as we think. Therefore, we should not let such a campaign stop social and economic development. What are your opinions about this speech?
  - i) Would you say that this speech represents the opinions of the public?
- b) What do you think are the possible reasons to make it difficult to promote leopard cat conservation campaigns in Taiwan? Why?
- c) Does the solar panel installation threaten the leopard cat conservation campaign in Tungshiau Township?

## **4) Reflection**

- a) From government units to civil organizations and even individuals, how do you think society should work together to achieve the maximum effect of leopard cat conservation?
- b) Do you have any further plans for the “Leopard Cat Rice” program?
- c) How do you feel about the future of the program? Why?

# Interview guide for technical specialist

## Interview Guide (the technical specialist)

Time: \_\_\_\_\_

Interview Platform: \_\_\_\_\_

Interviewee: \_\_\_\_\_

### Introduction & Purpose of the interview:

Good afternoon, Mr./Miss. \_\_\_\_\_, I sincerely appreciate that you are willing to take a part in my research work by joining this interview process as an interviewee. As a graduate student who is located in Norway now but trying to understand the status of implementation of leopard cat conservation programs in Taiwan, I am sure that your opinions and answers to my questions will help me to gain valuable insight into this field.

The purpose of my research is trying to understand the impact of the leopard cat conservation program (farming practice) toward the local farmers' livelihood. Before we start the interview, I would like you to understand that the need of the audio-recording throughout the whole interview is necessary for the further transcribing, however you can turn off the camera if you don't feel comfortable to let it on. I will be the only one who has access to the audio files, and these files will only be used in my research work. In addition, all the audio files will be deleted once I finish my paper. In the transcript of interviews, all the participants will be written down or mentioned in the paper anonymously. Apart from these, all the interviews in my research work will be conducted separately as individual interviews, which means no one else besides the participants would know the content of the interview, so you can be free to convey yourself thoroughly. During the process of answering my questions, you have the right of refusal whenever you don't feel comfortable to answer.

If you all understand and agree with what I mentioned above, we may begin with the interview and recording.

### 1) The background

- a) When did you start working in the leopard cat conservation field?
  - i) Follow up: Why did you decide to devote yourself to this field?
- b) What do you think of the conflicts between the leopard cat and the local villagers in Tungshiau Township?
  - i) Follow up: What is your role in dealing with the conflicts?

### 2) The development and promotion of the "Leopard Cat Rice" program

- a) Why did you want to establish this program?
  - i) What role have you been playing in shaping this program and assisting the local farmers?
- b) Were there any extra external assistance you brought from the government to support the development and implementation of the program?
- c) What are the most difficult challenges to promote the "Leopard Cat Rice" program? Why?

- d) In terms of your own perspectives, does the establishment of the program benefit the local farmers?
- e) So far, has the implementation of the program reached the goals?
- f) What would you say are the biggest changes generated by the establishment of the program?

### **3) Leopard cat conservation policy and issues**

- a) What were the reasons that the government started to promote leopard cat conservation?
  - i) What are the leopard cat conservation-related policy or regulation?
- b) Does the government work with any external authority to promote leopard cat conservation in Taiwan? Why?
- c) Would you say that the habitat fragmentation induced by the agricultural activity is the biggest threat towards survival of the leopard cat?
- d) What does the government do to balance the conflict between the local farmers and the leopard cat?
- e) Has the government had any further plan to establish the leopard cat protection area in Tungshiau Township?
- f) In The news from a few years ago, one governor had mentioned that the increasing number of the leopard cat road kills is due to the increase in its population, which means the leopard cat conservation campaign is not as urgent as we think. Therefore, we should not let such a campaign stop social and economic development. What are your opinions about this speech?
  - i) Would you say that this speech represents the opinions of the public?

### **4) Reflection**

- a) Does the government have any further plans for leopard cat conservation?
- b) How do you feel about the future of the program? Why?

# Interview guide for social enterprise

## Interview Guide (the Bluemagpie social enterprise)

Time: \_\_\_\_\_

Interview Platform: \_\_\_\_\_

Interviewee: \_\_\_\_\_

### Introduction & Purpose of the interview:

Good afternoon, Mr./Miss. \_\_\_\_\_, I sincerely appreciate that you are willing to take a part in my research work by joining this interview process as an interviewee. As a graduate student who is located in Norway now but trying to understand the status of implementation of leopard cat conservation programs in Taiwan, I am sure that your opinions and answers to my questions will help me to gain valuable insight into this field.

The purpose of my research is trying to understand the impact of the leopard cat conservation program (farming practice) toward the local farmers' livelihood. Before we start the interview, I would like you to understand that the need of the audio-recording throughout the whole interview is necessary for the further transcribing, however you can turn off the camera if you don't feel comfortable to let it on. I will be the only one who has access to the audio files, and these files will only be used in my research work. In addition, all the audio files will be deleted once I finish my paper. In the transcript of interviews, all the participants will be written down or mentioned in the paper anonymously. Apart from these, all the interviews in my research work will be conducted separately as individual interviews, which means no one else besides the participants would know the content of the interview, so you can be free to convey yourself thoroughly. During the process of answering my questions, you have the right of refusal whenever you don't feel comfortable to answer.

If you all understand and agree with what I mentioned above, we may begin with the interview and recording.

### 1) The background

- a) When did you start working for the environmental restoration for wildlife?
  - i) Follow up: Why did you decide to devote yourself to this field?
- b) What has the social enterprise been doing related to leopard cat conservation?
- c) Have you ever encountered any difficulties to promote the concept of ecological restoration? What were they?
- d) Have you realised the conflicts between the leopard cat and the local community in Tungshiau Township? How?
  - i) Is the social enterprise devoted to resolving the conflicts? How?

### 2) The promotion and implementation of the "Leopard Cat Rice" program

- a) Why did you decide to sub-manage the program?
- b) What is your expectation in implementing the program?

- i) Follow up: Is the goal of the “Leopard Cat Rice” program related to the goal of the establishment of the social enterprise? How?
- ii) Follow up: if not, have you adjusted the goal of the “Leopard Cat Rice” program?
- c) Has the “Leopard Cat Rice” program expanded the covering areas since 2019?
- d) Have you realised the perceptions of the participating farmers towards the program? How?
  - i) Compared to the previous system of the program, does it have any changes regarding their perceptions? In which ways?
- e) In terms of your own perspectives, does the implementation of the program benefit the local farmers?

**3) Future expectation**

- a) Does the social enterprise have any further plans for the “Leopard Cat Rice” program?
- b) How do you feel about the future of the program? Why?