Report on

2022 SDM Project

Inheritance and application

of Sotoyama farming knowledge in Nan'an tribe

Prepared For

SATOYAMA INITIATIVE

By

Tse-Xin Organic Agriculture Foundation

Dec, 31, 2023

Contents

A. Preface

The Nan'an village is an indigenous tribe (the Bunun) located on the outskirts of the national park surrounded by forests and rivers. About 50 years ago, the Bunun were forced to migrate from the mountains to the foothills due to the impact of colonization and modernization. Not only the way of Bunun' s farming and lifestyle but also the ethical relationship with nature have changed to a model that meets external market needs. Such changes have made farmers use a lot of pesticides and fertilizers to increase production and income, and caused harm to the environment and wildlife. In addition, farmers' income has become overly dependent upon single crop, which is vulnerable to market movement or climate change.

However, the wisdom of Bunun Satoyama is still practiced by the elderly and kept in the home gardens. We have found more than 20 species of landrace legumes that are not available in the market. The home gardens protect the diversity of crops, the richness of the food culture, and the biodiversity of the area. The SDM project integrated different stakeholders and conducted different activities to maintain the SEPLS and pass the knowledge and wisdom down to the young generation.

B. Correspondence with the Three-fold Approach

In the Three-fold approach, the conservation and resroation of landscapes and seascapes should entail six ecological and socio-economic perspectives. In this year's project we have planned four actions ,which are (1)Setting up a community seed bank ; (2)Setting up a learning farm ; (3)Developing innovative food and agriculture education programs of Bunun Satoyama ; (4)Habitat improvement practices in paddy field .

These actions are based on the six ecological and socio-economic perspectives emphasized in the Satoyama Initiative, which serve as a guide for the implementation of and the review of the actual results and benefits of their implementation.

Table 1 Action Plan corresponding with ecological and socio-economic perspective

Action Plan	Corresponding ecological and socio-economic perspective
1. Setting up a community seed bank	■ Value Recognition ■ Multi-stakeholder participation ■ Contributions to sustainable socio-economies ■ Improved community resilience
2. Setting up a learning farm	■ Value Recognition ■ Multi-stakeholder participation ■ Contributions to sustainable socio-economies ■ Improved community resilience
3. Developing innovative food and agriculture education programs of Bunun Satoyama	■ Value Recognition ■ Multi-stakeholder participation ■ Contributions to sustainable socio-economies
4. Habitat improvement practices in paddy field	■ Resource use within the carrying capacity and resilience ■ Value Recognition ■ Multi-stakeholder participation ■ Contributions to sustainable socio-economies

C. Executive Summary and Results of Activities

1. Setting up a community seed bank

In the past, the Bunun's social structure was based on clans and families, and seeds were passed from one generation to the next within the family. Through gatherings or marriages, there were opportunities for seed exchange between different clans, demonstrating the spirit of mutual assistance.

Due to changes of the social structure and the introduction of commercial seeds, this practice has slowly declined, but farmers in Nan'an still save and exchange seeds privately. In the SDM program, we established a small community seed bank to collect and exchange seeds.

So far, **a total of 27 kinds of bean and traditional crop seeds** were collected through tribal exchanges and donations. They are listed in the following table.

Table 2 The seed bank list

No.	Scientific Name	Bunun Name		Chinese Name	English Name
1	*Cajanus cajan*	Qalidang		樹豆	Pigeon pea, Cajan pea
2	*Lablab purpureus*	Pulavaz（tuza）		鵲豆、扁豆	Hyacinth bean
3		Pulavaz Dwubun			
4	*Phaseolus lunatus*	Pulavaz Papia		萊豆、皇帝豆	Lima Bean, Duffin Bean
5	*Phaseolus vulgaris*	Bainu Taqdung		黑芸豆、黑龜豆	Black turtle bean
6		Bainu Duglas		白腰豆、海軍豆	Navy bean, Great Northern Beans
7	*Phaseolus vulgaris*	Bainu Mumu			
8	*Phaseolus vulgaris*	Bainu Pingut			
9	*Phaseolus vulgaris*	Bainu Kaws		八家將豆	Cranberry bean
10	*Phaseolus vulgaris*	Bainu Patas		花豆	White Dutch Runner Bean
11		Bainu		大紅豆	

		Dangqas			
12	*Vigna unguiculata*	Bainu Laitaz		八月豆	Cowpea
13	*Vigna unguiculata*	Bainu duldul		站著的豆	
14	*Vigna unguiculata*	Bainu Dona		米豆、黑眼豆	Black-eyed pea, Cowpea
15	*Vigna umbellata*	Bainus Tanaul		赤小豆	Rice bean
16	*Vigna angularis*	Bainu Singing		紅豆	Adzuki bean
17	*Pisum sativum*	Bainu Luhu		豌豆	Pea
18	*Phaseolus vulgaris*	Bainu Mumu		鵪鶉豆	
19	*Vigna radiata*	Laian		綠豆	Mung bean
20	*Vigna stipulata*	Bainu Laitaz Taqdung		黑豇豆	
21	*Setaria italica*	Gaison		粳小米	Foxtail Millet
22		Nisnis		毛小米	Foxtail Millet
23		Maduq		小米	Foxtail Millet
24	*Eleusine coracana*	Salaz		龍爪稷	Finger Millet
25	*Sesamum indicum*	Nadaz		芝麻	Sesame
26	*Momordica cochinchinensis*	Sukui		木鱉子	Wooden Tortoise
27	*Oryza sativa subsp. javanica*	Paaz qamisan		旱粳稻	Upland Rice
28	*Sorghum nervosum var. flexibile*	Sumsum		散穗高粱	Sorghum

These seeds were not only exchanged among the tribal people, but also shared with elementary and middle schools in eastern Taiwan, and openly exchanged at seed exchange meetings throughout Taiwan, with a **total of over 60 people benefiting from the seed bank.**

Below are some photos of the collection, exchange and sharing of seeds.

Collecting Seeds

Sharing Seeds

Picking Seeds

Sharing Seeds

Picking millets

Harvesting millets

openly exchanged at seed exchange meetings

openly exchanged at seed exchange meetings

	
For the purpose of display and promotion, some of the seeds are also made into specimens.	For the purpose of display and promotion, some of the seeds are also made into specimens.

2. Setting up a learning farm

The learning farms is the main place where traditional farming wisdom is gathered and exchanged. The farmers demonstrate their traditional agricultural knowledge and techniques through practical work. The youth and elders are brought together in each activity to share food, farming and work together, allowing the elders to naturally show their agricultural knowledge, while allowing the younger generation to recognize and learn the traditional agricultural wisdom of Bunun and the value of the elders, so that the Satoyama wisdom of Bunun can be passed on to the next generation. The table below is a summary of the activities in the learning farm.

Table 3 Activities summary of the learning farm

Date	Activity Summary	No. of Participants
2/15	Local farmers farmed and ate together. Introducing tribal farmers to outside organizations through gatherings, including the Hualien District Agricultural Improvement Farm and university professors teaching indigenous culture and design program.	17
3/13	Visitors learned about the Bunun's sowing rituals and how to plant grain in the learning farm, and experienced cooking millet rice on a three-stone stove and preparing Bunun bean and bean soup with wild vegetables.	46
4/11-12	A group of Tse-Xin staff and volunteers visited Nan'an to learn how to plant seasonal crops with elders in thelearning farm, to taste local flavors, and to engage in cultural exchanges.	42
4/16	Local farmers' meeting, farming and eating together. Harvesting beans.	18
5/17	Local farmers farming and eating together. Maintenance of seed-preserving fields (seedling thinning and weeding) and transplanting of traditional crops to vegetable gardens for replanting	19
5/21	Workshop of traditional farming wisdom. Linking the young generation and the elders to learning on the topic of home garden crops.	17

10/15	University students visited Nan'an. They Investigated and observed the elders' vegetable gardens, recorded the structure of the gardens, helped harvest peanuts and learned to cook millet rice for lunch.	32
11/8	Workshop on repairing huts and organizing community farming and food activities. Elderly tribesmen teach young and middle-aged people how to use natural materials such as straw and bamboo to repair the hut and organize community farming and food activities.	12
Total number of people		**203**

At the Learning Farm, **more than 200 local farmers** or visitors shared and learned traditional agricultural wisdom. Below are photos of activities at the learning farm：

Local farmers' meeting

Local farmers' meeting

Local farmers farmed together

Picking millets

the young farmer interviewed the elder

Trying with traditional grain-based snacks

Co-farming

Co-farming

Co-farming

Co-farming

Cooking millets in the traditional way

Co-farming

3. Developing innovative food and agriculture education programs of Bunun Satoyama

The preservation of traditional landrace seeds depends on the continuous planting and using by local people. The culture and knowledge that goes with it also needs to be passed on from one generation to the next. Therefore, we plan to work with local primary schools to support in situ conservation by integrating it into the school curriculum. We invited the farmers, local school, experts and visitors to come develop innovative education programs of Bunun Satoyama together.

Four R&D workshops were held with 107 participant. The topics included the collection of conventional wisdom and trial run of teaching activities, as shown below：

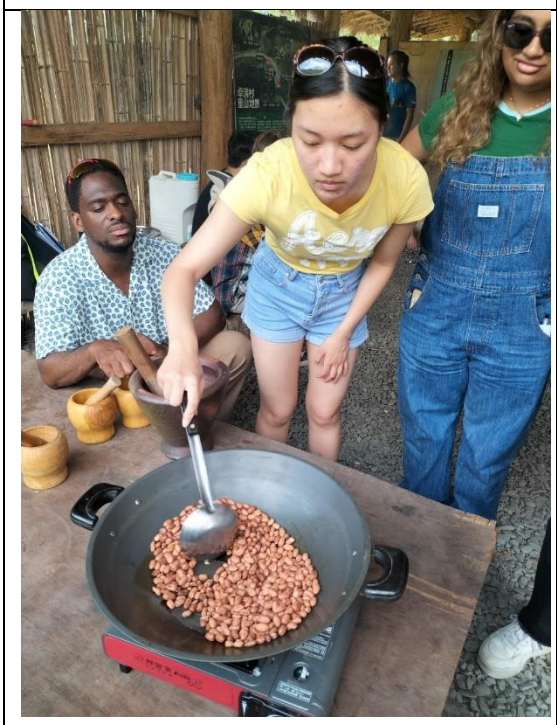
Table 4 List of education program R&D workshops

Date	Activity Summary	No. of Participants
2/2	Prof. Zhang Wei-Chi, an expert in food and agriculture education, interviewed the elderly and led the farmers to draw a food and agriculture calendar.	14
2/3	Prof. Zhang Wei-Chi led food and agriculture calendar activity at Tribal Culture Health Station.	31
3/1	The 4th to 6th grade students of Zhuoqing Elementary School came to the Learning Farm for agricultural education.	18
6/2	Students from Vassar College USA came to visit Nan'an. They experienced the traditional life of the Bunun, such as shelling grain, roasting peanuts, and chopping wood, and learned the wisdom of the Bunun's traditional home gardens ; planting Artemisia capillaris next to the ditch of the farm.	44
Total number of people		**107**

Below are photos of R&D education program workshops：

Drawing the food and agriculture calendar

Drawing the food and agriculture calendar



Trial run of teaching activities-frying nuts

Trial run of teaching activities

Trial run of teaching activities-

Trial run of teaching activities-filter

learning about traditional plants	millets
	
Picking wild vegetables	Group photo

After data collection, trial and discussion, **1 set of educational material has been produced** as below.

Table 5 The education program-Bunun's Wisdom of Satoyama Life

Name of Program	Bunun's Wisdom of Satoyama Life		
Time	120 minutes.	Number of people	Less than 40 persons
Topics	Satoyama, Traditional Ecological Wisdom, Food and Agriculture Education		
Design Concept	The Bunun have a rich agricultural wisdom and a way of making good use of natural resources. By maintaining a wide variety of crops, the Bunun have adapted to different terrains and environments and have been able to cultivate a wide variety of traditional legumes and wild vegetables that are resilient to climate change, enriching the Bunun's source of nutrients and the flavors on the table.		
Learning Objectives	1. Learning to use traditional tools such as mortar and pestle, gabion, etc. for threshing, shelling, and sifting grain. 2. Conventional bean processing - peanut skinning and roasting 3. Experiencing traditional tools - using wood knives, etc. to split wood and obtain fuel. 4. Learn about Bunun wild food gathering - picking and cleaning wild vegetables.		
Facilities	1. rattan gabions, wooden pestle and mortar 2. Ingredients: peanuts, millet, wild greens 3. Traditional tool: wood chopper 4. Others: Canvas, Rapid Cooker, Wok, Casserole, Small Frying Pan		
Site Requirements	Open space, access to firewood, open fire, clean water supply		

Flow of Teaching Activities				
passages	Content	Objectives	Remarks	Time
Use of pestle and mortar	1. Learning to remove millet from ears 3. Learning to hull millet and sift the hulls.	Learn how Bununs use mortars and pestles to remove husks from their grains.	Reminder of the way the force is applied	30 minutes.
Traditional bean processing	Learn to fry and process peanuts (peeling and mashing)	Understanding the culture of Bunun food production	Reminder of food processing hygiene.	30 minutes.
Using	Use of tools such	Experience	Safety precautions	30

Traditional Tools	as knives for splitting wood and obtaining fuel	building a fire the old-fashioned way	are explained at the beginning of the program (including the way of holding the knife, and the necessity of spreading the feet when standing).	minutes.
Bunun's Field Foods	Wild Vegetable Cleaning and Selection			30 minutes.
[Remarks]Groups will be divided into 4 groups, each group and each station has 30 minutes.				

4. Habitat improvement practices in paddy field

About 50 years ago, the Bunun were forced to migrate from the mountains to the foothills. Their diversified production of mixed grains in the mountains was replaced by a single rice crop (paddy rice) in the plains. This change has led farmers to use large amounts of pesticides and fertilizers to increase production and income, causing damage to the environment and wildlife. There is also a decline in the diversity of grasses on the ridges.

During the SDM project, we organized **four habitat improvement activities with 128 participants** and inviting the elders, local schools, visitors and ecological experts to participate with local farmers. In the past, rice paddy fields had a very homogeneous food landscape. In this project, we introduced traditional grains into the ridges of the rice paddy fields, which increased biodiversity and also increased farmer's attention to biodiversity of the the paddy fields.We incorporate local folk plants and traditional crafts to enrich the landscape and ecology of the rice paddies.

Table 6 Summary of habitat improvement practices

Date	Site	No. of Participants	Description
1/17	Ali Mama' s fiel	5	Red quinoa, a traditional food crop of the Bunun people, was planted on the ridges of the rice fields. This is done to increase the biodiversity of the rice fields and to discourage the use of herbicides on the ridges because of the emotional connection between the farmers and the quinoa.
			

6/2	Wong Ching Tak's field	44	The site is on Wong Ching Tak's irrigation ditch, which was bare ground before it was improved. Because of the conventional management, herbicides were sprayed on the ridges and ditches to control weeds, which caused some disturbance. This time, we led the students to plant Artemisia spicata, which is a Bunun folklore plant that grows in the riverbed environment. The plant contains essential oils that used to be used as mosquito incense to fumigate the house to prevent mosquitoes and repel insects. It is now rare due to the use of herbicides. Artemisia has an emotional connection to the Bunun. It protects the soil, stabilizes the soil ditches, reduces the frequency of herbicide spraying by farmers, and enriches the landscape of the field to form a relatively stable microhabitat for small animals.
 Before the improvements, the ridge soils were bare and had low biodiversity.			 we led the students to plant Artemisia spicata.

<table>
<tr><td colspan="3">  </td><td>  </td></tr>
<tr><td colspan="3">Students were planting the plants.</td><td>The plant grows well in November.</td></tr>
<tr><td>7/5
8/9</td><td>Learning Farm</td><td>10</td><td>On the learning farm, we built irrigation ditches and invited elders to guide us to pass on the wisdom of traditional craftsmanship.
Various small-scale agricultural facilities, such as stone masonry and ditches, can make the vegetable garden structure more diverse, creating a microhabitat environment. Stone masonry can also stabilize the slopes of ecological ditches, making the ditches more solid and achieving the function of soil and water conservation.</td></tr>
<tr><td colspan="3">  </td><td>  </td></tr>
<tr><td colspan="3">Digging irrigation ditches with an excavator</td><td>Inviting elders to teach us</td></tr>
</table>

<table>
<tr><td colspan="3"> 
The ditch and the stone mansonry</td><td> 
The ditch and the stone mansonry</td></tr>
<tr><td>10/8</td><td>Lin Ren- Yi's field</td><td>69</td><td>Volunteers of Tse-Xin Foundation visited Nan'an. They planted white berry bush seedlings on the irrigation ditch in Lin Renyi's field.
This ditch receives water from the rice fields, and as long as there is water, it will be the best habitat for Medaka.
The white berry bush tree is often mentioned by the Bunun elders. In their childhood, it was a common snack along the roadside but has disappeared from the fields in recent years, probably due to herbicides. This time, we planted it along the irrigation ditches in the field, hoping to provide shade for Medaka, habitat and foraging for birds, and to increase the diversity of the landscape and biodiversity in the field.</td></tr>
</table>

 Volunteers planted white berry bush seedlings on the irrigation ditch.	 Volunteers planted white berry bush seedlings on the irrigation ditch.
 The white berry bush tree	 The ditch is habitat for Medaka

D. Exceptional Result

1. A broader support network was built

In September, **the Bunun Satoyama workshop with more than 70 participants** was held. The publics interested in the Satoyama wisdom went deeper into the fields of Nan'an; other Bunun preservationists were also invited to come and share each other's pains and sorrows, thus building a broader support network and community relationship.

Through the establishment of the Learning Field and the Seed Bank, Nan'an has become one of the most important seed preservation teams among the Bunun in Taiwan. The Satoyama wisdom has not only been passed on within the tribe, but has also made Nan'an become a stronghold and platform for seed preservation in Taiwan .

2. A video was produced

We have edited the footage of the Bunun Satoyama workshop into a **2-minutes video**, which will be used to promote Nan'an's farming wisdom to the general public in the future.

The video **can** be downloaded here：

3. Hosting international visiters

The implementation of the SDM program has also been emphasized by the international communities; in April, Ms. Makiko Yanagiya, Deputy Executive Director of the IPSI, visited the Nan'an .Through the reception and explanation of the tribal people, she exchanged practical knowledge and learned from the Bunun's traditional agricultural wisdom; in June, a professor from the Department of Political Science and Economics of Vassar College led students to visit Nan'an; in August, a group of rural environmental planning experts from Japan came here. The Nan'an case has been known recognized by the international conservation and academic communities.

E. Lesson learned and conclusion

1. We need to be careful about how often we mobilize the farmers

Because it is not easy for groups to get together, and in order to avoid over-mobilizing the farmers and affecting their willingness to participate, at every meeting for plowing, laboring, or activity sessions, we often hear elders say, "I'm too busy to do this, I have to go over to mow the lawn later. In the busy lives of the farmers, it is necessary to make appointments in advance for each member of the tribe to be able to carry out the various activities of the program.

2. Awareness to avoid internal conflicts due to the distribution of income

We need to be particularly careful to avoid internal conflicts in the distribution of income from activities.

The visits bring income to the farmers, but there are also frictions in the final handling of income and expenses. For example, when encouraging farmers to use ingredients from their own gardens to serve meals, some people charge more for the ingredients they provide, while others provide them at a lower price or even for free. There are no explicit standards for this, and it is all up to the tribesmen themselves, but it is often a source of friction.

For this reason, we currently have two approaches: for small-scale activities, we allow the farmers to provide and quote prices themselves; for activities that require the mobilization of more manpower, the project team would coordinate and distribute the budget. After the event, the project team will also publicly explain the income and expenditure, and emphasize the focus to support and protect the SEPLS.

As outsiders, we must face up to the impact the mainstream culture have had on rural tribes and indigenous cultures. In the process of re-discovering traditional agricultural and ecological wisdom, making the elders feel respected and recognized by their collaborators not only helps the elders feel more confident, but also responds to the important issue of transitional justice today.

The experience of the SDM project can also serve as a reference for organizations and tribal communities interested in how to live in harmony with nature. Perhaps what is special is not the Bunun home gardens or Bunun landraces, but that when we think about and seek ways to develop cooperation and harmony between human and nature, it is a viable way to look back to local history and traditions. We believe

that every region has its own treasures, its own Satoyama wisdom , waiting to be unearthed and revitalized.

F. Appendix – Brochure of the Bunun Satoyama Workshop

The brochure is in Chinese. Please see the next page.

布農里山走讀暨實踐者工作坊

活動手冊

布農豆豆班

PAINU

主辦單位：林業及自然保育署花蓮分署

贊助單位：聯合國大學里山倡議網絡（IPSI）、玉山金控、玉山文教基金會

承辦單位：慈心有機農業發展基金會、布農豆豆班

時　　間：2023 年 9 月 14 日-15 日

活動流程表

九月十四日		
時間	內容	地點
13:00--13:30	報到	南安遊客中心集合
「布農里山走讀」走動式工作坊		
13:30-14:00	布農坡地耕作智慧	余淑貞耆老、胡玉英迪娜田區
14:00-14:30	布農的水田-農田生態與棲地營造	林錫輝、林麗民田區
14:30-15:10	布農食物森林	潘竹菊耆老、高秀琴耆老菜園
15:10-15:30	休息	南安遊客中心
15:30-16:00	分組討論與分享	布農豆豆屋
16:00-17:00	交流與茶點時間	
17:00--	休息，前往住宿地點	

九月十五日		
時間	內容	發表人
8:00-8:30	報到	
布農里山智慧實踐者分享		
8:30-8:50	卡里布安部落實踐經驗—— 我家的小米	Nieqo Soqluman 全慈豪
8:50-9:10	東華小米田與東布青—— 大學青年串連靠近母體文化	Salizan Istandaa Takihusungan 胡克緯
9:10-9:30	布谷拉夫部落兒童永續教育	Banu Ismahasan 邱曉徵
9:30-9:40	休息	
9:40-10:00	馬遠部落祖居地復返—— 青年回祖居地的當代意涵	Atul Taisnunan 田主聖
10:00-10:20	山胡椒基地實踐經驗 —— 種回山上的田	Dahu Takishusungan 胡榮茂
10:20-10:40	崁頂蓋亞那工作坊 —— 食物，和母親的學習	Ibu istanda 胡郁如
10:40-10:50	休息	
10:50-11:50	布農豆豆班布農里山智慧接傳人成果發表（六組）	
11:50-12:10	長輩講評、各地實踐者回饋	
12:10-12:20	頒發感謝狀、大合照	
12:20-13:30	享用布農的餐桌	
13:30--	賦歸	

卓溪鄉卓清村里山地景

以下內容引自：慈心有機農業發展基金會（2023），林業及自然保育署花蓮分署委辦案。「花蓮縣卓溪鄉布農里山智慧教育深耕及推廣活化」期初報告書。

本區的農耕地景根據耕作經營目的，可略分為以大面積單一位作物的產業型農耕型態，以及小面積作物多樣化的自給型農耕型態。

一、產業型農耕地景

卓溪鄉卓清村產業型農耕地景包括水稻田、果園、薑園、南瓜或高麗菜園、苦茶園等。其最主要特色乃是受到外部主流市場需求趨動而建置，為了服膺主流市場既有的產銷體系的要求，以追求降低生產成本與提高產量為目的，通常會採取單一作物規模化的生產方式，其作物種類與農田環境單一，田區面積較大，並為了大面積管理上的需求，大多採取機械化，以及使用農藥與化學肥料的慣行耕作管理方式。

水稻田是本區域內最顯著的農耕地景。為了灌溉需求，主要分布在溪流兩側堆積灘地。其中南安部落水田面積約 40 多公頃、卓樂部落約 50 多公頃、清水部落約 30 多公頃。除了南安部落已轉型有機耕作約 16 公頃外，其餘皆採取慣

行耕作。然而現今的水田產業模式，也僅能提供部落極少數農家生計需求，多數族人仍仰賴到外地工作或透過打零工維生。

此外，水田耕作與在地的溪流生態系統息息相關。溪流生態系統中的物種，包括水生動植物與微生物等，會隨著灌溉系統被溪水帶入到水田，進入農田濕地生態系統中，形成溪流生態系的延伸；而農民在水田進行經營管理時，投入的殺草劑、殺蟲劑、殺菌劑、殺螺劑及肥料等資材，包括各種營養鹽與化學物質，也會跟著灌排系統，回到自然溪流當中，進而影響到溪流的生態環境。

二、自給型農耕地景

以各類家庭菜園為主，散佈鑲崁在森林與溪流邊緣，以及緊鄰道路、聚落甚至水田邊際旁的各種畸零地。菜園規模小，多數不足 1 分地，操作上以人力為主，作物種類與農田環境複雜且多元，管理上較少使用農藥與化學肥料。

其種植主要是以滿足家庭自給、鄰里間餽贈、親屬與熟人網絡間的小規模交易為主，不是以供應外部市場為目的，蘊含著布農族的文化脈絡(傳統作物保種、與長輩和祖靈世代相承的情感、布農婦女德行展現的倫理觀)。

比較田區的作物品項與品種以及農耕環境的差異，自給型農耕地景，不但作物種類與品系繁多，菜園結構除了有各種小型農業設施，如支架、砌石、溝渠等，從高莖到低莖、木本、藤本到草本的作物組成，都使得菜園結構較產業型農耕地景複雜多樣，形成各種生物微棲地環境。

過去幾年也觀察到，計畫場域中，水稻農民會將傳統作物例如豆類、紅藜、南瓜等，種植在田埂上。由於水稻農友為了避免田埂雜草對水田管理的影響，會施用除草劑防治，或者於一個期作當中(約 4-5 個月)，進行 3-4 次的割草作業，對田埂進行頻繁的干擾管理。而有種植傳統作物的田埂，由於這類作物不大需要照顧，農民種植作物後，直到作物採收期，都不會對田埂進行干擾，這樣的管理方式，不但對田埂的土壤起了保護作用，而期間也會形成相較於周邊其他頻繁被干擾的環境來說，相對穩定的微棲地，供應包括各種地棲無脊椎動物 (如昆蟲、蜘蛛、蝸牛等)、兩棲爬蟲類 (蛙類、石龍子、蛇類) 與小型鳥類 (斑文鳥、鷦鶯等) 的棲地，以及提供庇護或食物來源。

此外，布農族傳統於坡地沿等高線砌石，順應地勢構築梯田，並沿等高線種植灌木型的樹豆的坡地農耕方式，對穩固坡地，減少強降雨逕流沖蝕，也起了作

用。以上這些布農的傳統農耕方式，或許可以提供如何豐富單一作物栽培地景的生物相，或者減緩坡地開發農耕的衝擊。

三、布農當代的生產生活變遷

受到殖民與現代化的衝擊，加上生活環境的變遷（從 1000-1500 公尺山區遷徙到平原），造成族人的生產與生活方式，在數十年間，起了很大的變化。使得傳統布農文化中，有關土地和自然資源取用和管理，得以維繫人與自然和諧共存的傳統智慧與在地知識逐漸消逝中。

而部落青壯年人口也面臨大量流失，而不同世代，由於面臨的社會背景已經迥異，青壯世代在缺少過去長輩在坡地耕作，以自給自足為主的農耕生活經驗，造成世代間隔閡問題，文化傳承出現斷裂。

儘管如此，布農的傳統農耕知識與智慧仍未完全消失，仍保存在部落許多長者的日常生活實踐與記憶中，以及主要經營者為年長婦女的家庭菜園當中。婦女在菜園中所保存的眾多作物品種與品系，特別是多樣性極高的各種豆類，有助於在地社區面對日益嚴峻的氣候變遷下的韌性（resilience）。

此外，長者婦女們所經營的家庭菜園，混植各類包括從木本的喬木類果樹、香料植物刺蔥，和作為農田邊際的竹子、檳榔等；灌木類的樹豆、澱粉作物木薯與藥用的毛脈三葉五加等；高莖的禾穀類作物小米、玉米、紅藜、油芒等，和特用的甘蔗、香茅、苧麻等；各種低莖的草本豆類、蔬菜；具有攀緣性的蔓藤作物，包括鵲豆、萊豆、山苦瓜等，以及經常被用來和高莖作物混植，作為覆蓋雜草作用的甘藷（地瓜）、南瓜等。而菜園也會刻意保留一些野生的植物供採集利用，例如山萵苣、飛機草、昭和草、兔兒菜等布農人喜歡的野菜與藥草，以及構樹（飼料用，餵山羊）、無患子（清潔用），甚至是外來植物銀合歡，也有長者婦女會將自然擴散，長在菜園中的銀合歡保留下來，讓豆類攀爬。

Galluzzi 等（2010）指出，像這樣的家庭菜園，各類作物混植，形成了多層佈置（multilayered arrangement）結構，並且木本、草本與藤本不同作物類型，也有不同的根系結構，不同作物根系會進入到土壤不同分層中，更能有效運用從地底、地面到空中不同空間，落葉也會提供自然覆蓋和腐殖質的積累。比起單一作物農田結構，更能防止土壤流失以及保持土壤肥力，並更接近於森林結構，類似於混農林業系統（agro-forestry system）。加上家庭菜園普遍上使用較少的肥

料與農藥投入，可保護菜園內部與菜園周邊生物的自然棲息地，並保持較高的微生物多樣性。

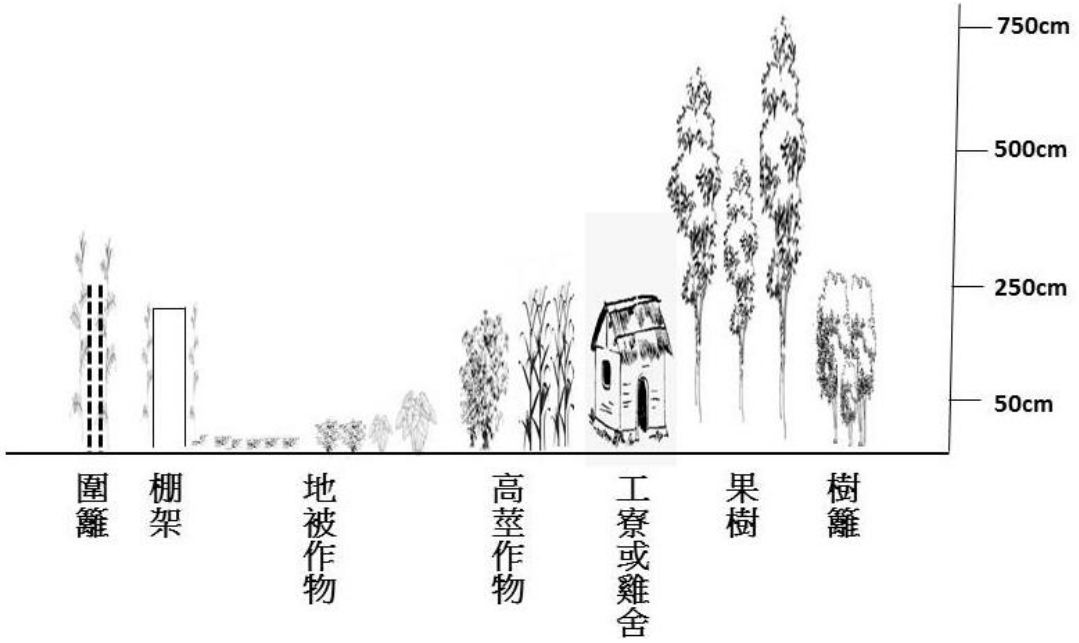


圖 1：菜園垂直結構示意圖（林志忠繪製）

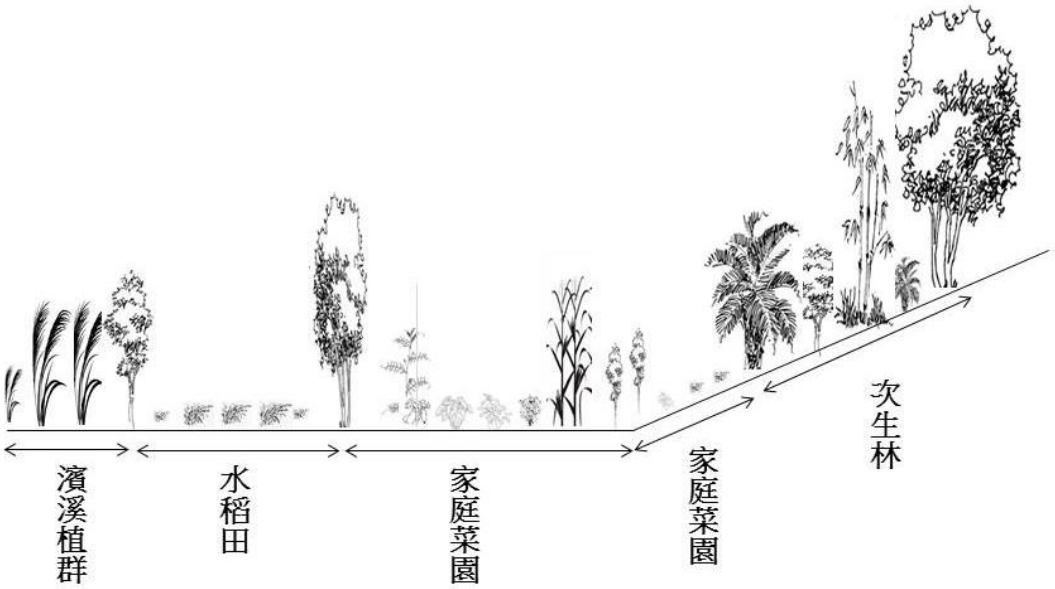
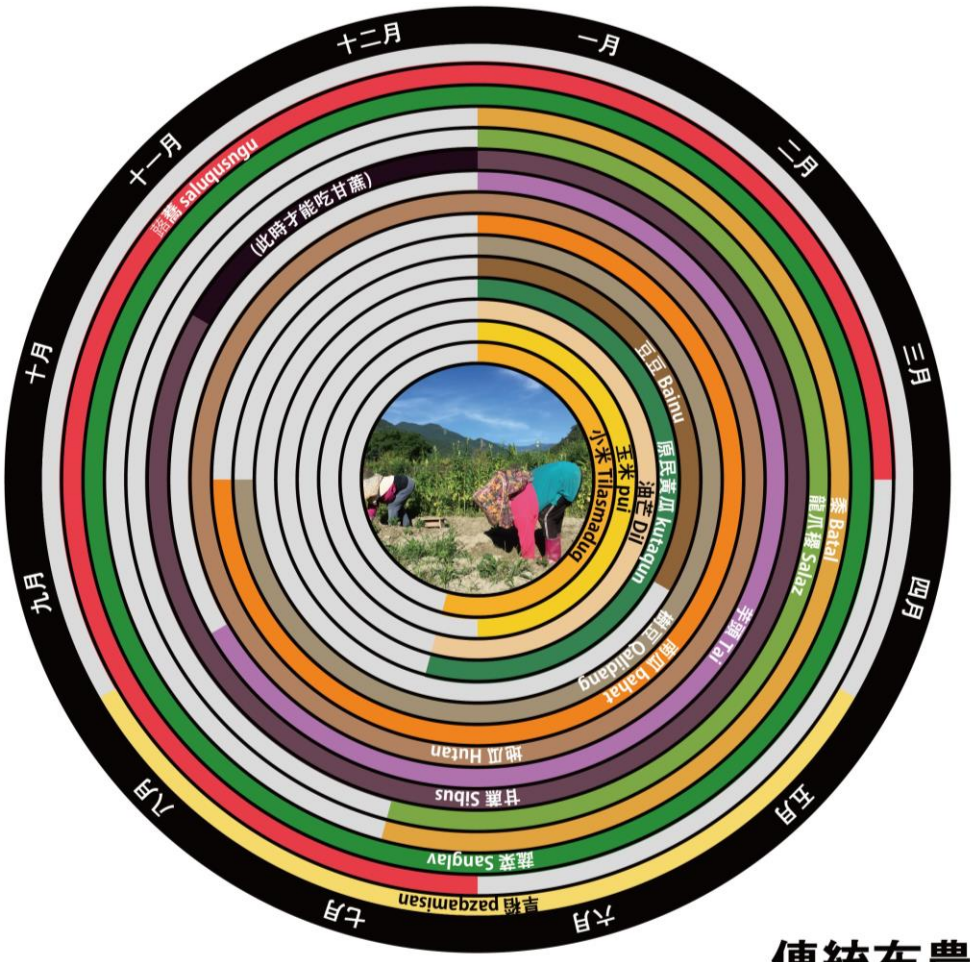


圖 2：菜園及鄰近植被垂直示意圖（林志忠繪製）


一月
二月
三月
四月
五月
六月
七月
八月
九月
十月
十一月
十二月
(此時才能吃甘藷)
薯蕷 saluqusngu
旱稻 pazqamisan
蔬菜 Sangiav
甘藷 Sibus
地瓜 Hutan
芋頭 Oalitang
樹豆 bahat
龍爪稷 Tai
黍 Batal
薯蕷 Salaz
豆豆 Bainu
原民黃瓜 kunabun
油芒 Dil
玉米 pwi
小米 Tilasnapdaqa
傳統布農坡地旱作作物曆
小米
玉米
油芒
黃瓜
豆豆
樹豆
南瓜
地瓜
芋頭
甘蔗
龍爪稷
黍
蔬菜
薯蕷
旱稻