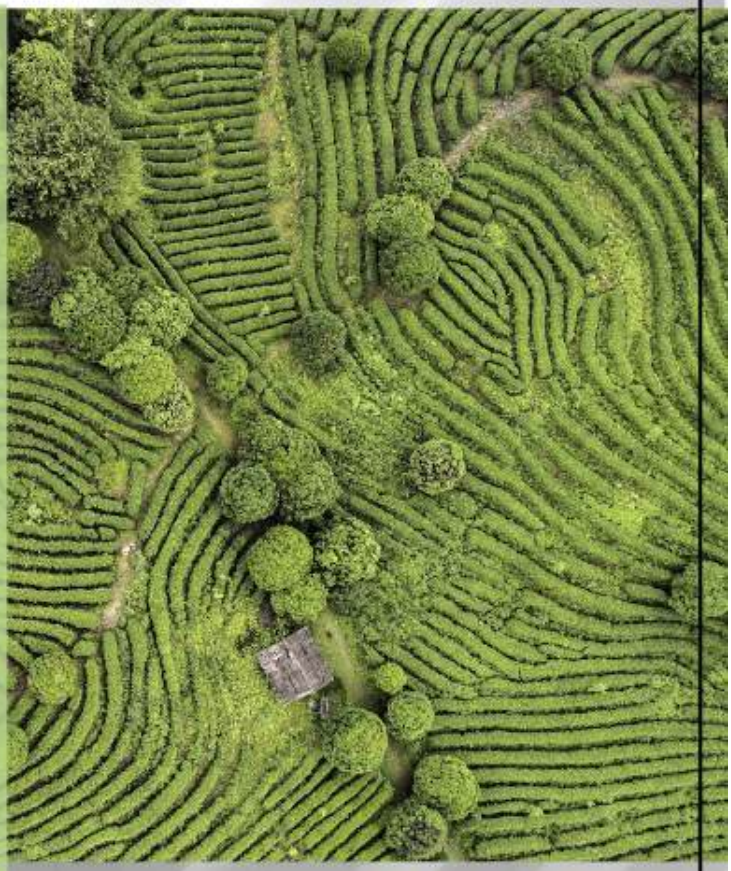
APN
ASIA-PACIFIC NETWORK FOR
GLOBAL CHANGE RESEARCH

FINAL REPORT

Resilience-building among smallholder farmers of selected upland farming communities in the province of Isabela, Philippines



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Annex 1. Project Briefings and Selection of Priority Upland Farming Communities in Isabela Province.

Coordination meeting with stakeholders was conducted on 12 November 2021. The meeting was attended by heads and representatives from various Offices of the Provincial Government of Isabela particularly the Provincial Planning and Development Office (PPDO), Office of the Provincial Agriculturist (OPA) and Environment and Natural Resources Office (ENRO), Department of Environment and Natural Resources – Provincial Environment and Natural Resources Office (DENR-PENRO), Department of Agriculture – Regional Field Office 2 (DA-RFO 2), Isabela State University (ISU), and Institute of Agroforestry (IAF) (**Figure 1**). The project description including a brief history of APN and the project, objectives, expected outputs, methodology and work plan were presented to the stakeholders. The different roles of stakeholders were also discussed during the meeting. The Provincial Local Government Unit (PLGU) expressed their gratitude for bringing this APN's capacity development project to the upland farmers in the province and the partners reiterated their support to the project. They even suggested increasing the number of sites, the funds for the additional sites of which will be shouldered by the PLGU.

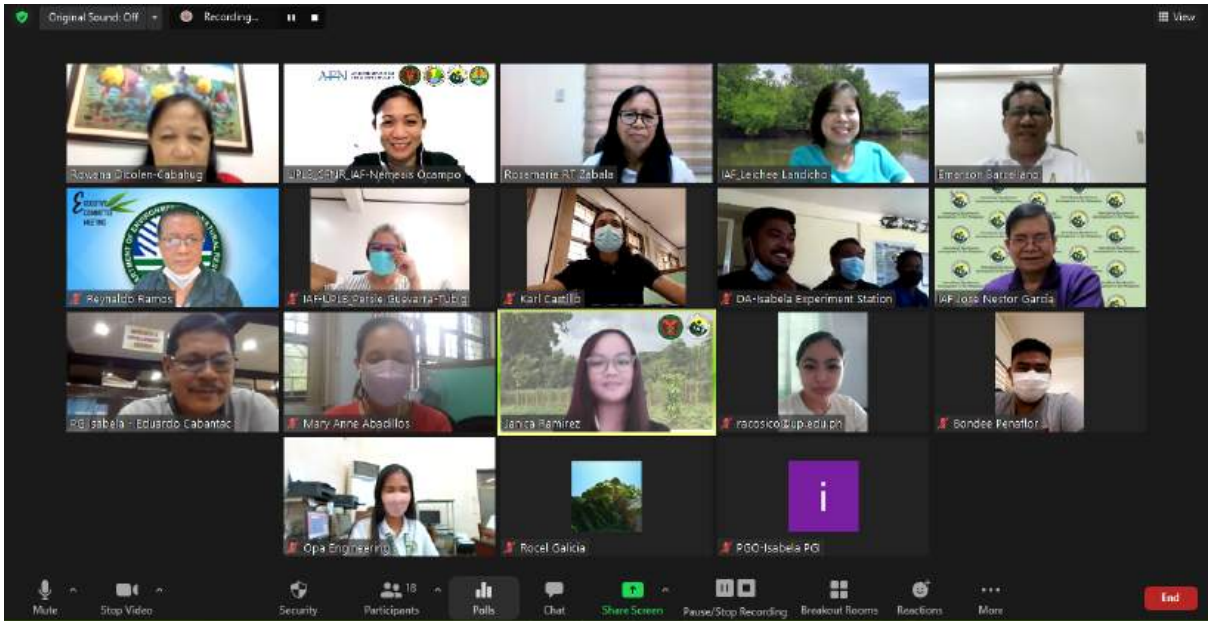


Figure 1. Stakeholders' meeting and priority site selection on 12 November 2021 participated in by heads/or representatives from PLGU (PPDO, OPA, ENRO), DENR-PENRO DA-RFO 2, ISU, and IAF.

Criteria for Selection of Priority Municipality, Community, and Model Farm

The collaborators initially drafted the proposed site selection criteria for pilot municipality and barangay prior to the stakeholders' meeting. The proposed criteria for selection were presented to the stakeholders and deliberated during the coordination and project briefing meeting on 12 November 2021. The head of PPDO, Atty. Eduaro R. Cabantac, suggested to include in the list of criteria that the project must be in line with the priority projects/programs of the Municipal LGU to ensure the projects' sustainability. This can be initially validated through reviewing the Comprehensive Land Use Plan (CLUP) and/or Forest Land Use Plan (FLUP) of selected municipalities. The stakeholders identified the municipalities of Cabagan, Tumauini, and San Pablo as pilot municipalities during the meeting based on agreed upon selection criteria.

The selection criteria for pilot municipality and partner upland community were deliberated and finalized by the stakeholders during the provincial level meeting with Cabagan, Tumauini and San Pablo as selected partner municipalities. The partner upland communities were identified by the stakeholders during the municipal level orientation and meetings. Moreover, the selection criteria for model farm were firmed up by the stakeholders in each project site. This served as the basis of the local stakeholders in their selection of model farm sites.

Site Selection Criteria for Pilot Municipality

1. Accessibility of the site/proximity.
2. Peace and order situation.
3. Presence of upland farming community with smallholder/small-scale farmers (majority cultivating 2 hectares and below).
4. Willingness of the Municipal Government Unit to be part of the multi-stakeholder group with IAF-CNFR, ISU, People's Organization, DA, DENR, and other concerned government and non-government organizations actively working in the area that will spearhead the implementation, monitoring, and evaluation of the project on resilience-building among smallholder farmers in the locality.
5. Willingness of the Municipal Government Unit to actively participate and be involved in the implementation of the project on resilience-building among smallholder farmers in the locality.
6. Willingness of the Municipal Government Unit together with the local multi-stakeholder group to perform (participate) in regular project monitoring and evaluation.
7. Municipal Local Government Unit is willing to provide counterparts (committed Municipal Agricultural Technician/s for project implementation and monitoring, venue for seminars/trainings, etc.).
8. Willingness of the Municipal Government Unit together with the Barangay Council and People's Organization to take the lead in actively promoting agroforestry systems in their locality.

9. Past and present (or maybe future plan as reflected in their CLUPs, etc) initiatives of implementing a similar project to determine if our project could fit in and for project sustainability.

10. Proximity to existing AF-related project/institution (i.e. ISU, even NGOs or POs such as Conservation International, DENR, DA, etc).

11. Identified area for agroforestry development in CLUP/FLUP.

Site Selection Criteria for Pilot Barangay

1. Accessibility of the priority site.

2. Peace and order situation.

3. Upland farming community with smallholder/small-scale farmers (majority cultivating 2 hectares and below).

4. Presence of active People's Organization.

5. Willingness of the Barangay Council to be part of the multi-stakeholder group with IAF-CNFR, ISU, Community-based Organization, DA, DENR, and other concerned government and non-government organizations actively working in the area that will spearhead the implementation and monitoring of the project on resilience-building among smallholder farmers in selected upland farming community.

6. Willingness of the People's Organization to be part of the multi-stakeholder group with IAF-CNFR, ISU, DA, DENR, and other concerned government and non-government organizations, actively working in the area that will spearhead the implementation and monitoring of the project on resilience-building among smallholder farmers in selected upland farming community.

7. Willingness of the Barangay Council and People's Organization to take the lead in the implementation, monitoring and documentation of the project in the locality.

8. Willingness of the community to develop and maintain appropriate agroforestry model farm.

9. Willingness of the People's Organization together with the Barangay Council and Municipal Government Unit to take the lead in actively promoting agroforestry systems in their locality.

Proposed Selection Criteria for Model Farm/Farmer

1. Must be an active member of the Farmers' Organization (Masipi Upland Farmers Organization in Masipi East, Cabagan; Amabvi Greeners Association in Limbauan, San Pablo; Sierra Madre Greeners Association in Dy-Abra, Tumauini).

2. Landowner with 2 hectares and below (smallholder).

3. Accessibility of the model farm/located in a strategic area (production area) within the barangay.

4. Willingness of the partner farmer to allocate a portion of his/her farm (at least 2,500 m^2) for the establishment of agroforestry system/technologies demonstration area.

5. Commitment of partner farmer to maintain the agroforestry system in his/her farm.

6. Willing to provide counterparts (labor for development, establishment and maintenance).

7. Partner farmer is willing to share his/her knowledge on agroforestry systems and technologies with other farmers in the community/other communities and will serve as a local para-technician.

8. The model farm will serve as a showcase agroforestry farm and the partner farmer is willing to let his/her farm to serve as a learning venue for seminars and trainings.

9. Ensure farm documentation and record keeping.

10. Willingness of the farmer to perform regular monitoring and evaluation of the model farm.

11. Willingness of the farmer to be part of the multi-stakeholder group with IAF-CNFR, ISU, People's Organization, concerned government and non-government organizations actively working in the area (e.g. DA, DENR, etc) that will spearhead the implementation, monitoring and evaluation of the project.

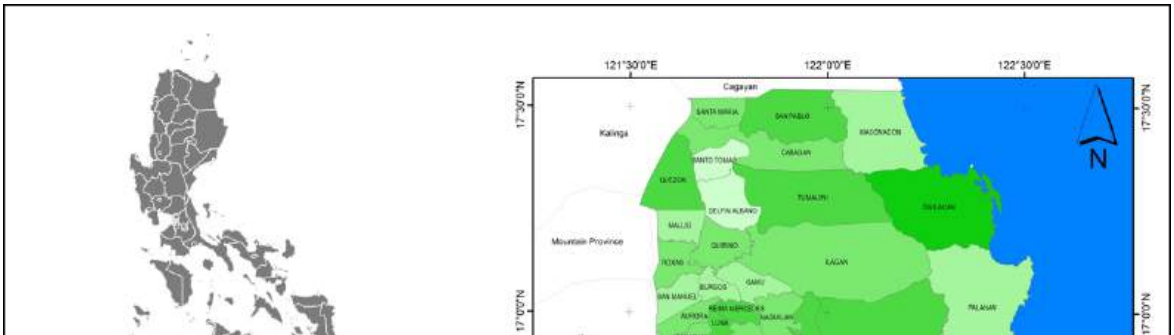
12. Willingness of the farmer together with the People's Organization, Barangay Council and Municipal Local Government Unit to take the lead in actively promoting agroforestry systems in their locality.

13. Willingness of the farmer partner to share percentage of the income from the model farm to the farmer organization as organizational funds.

Appendix 2. Characterization of Selected Upland Farming Communities and the Impact of Global Pandemic in Isabela Province.

Socioeconomic and biophysical characterization of the three upland farming communities (**Figure 1**) were conducted through household surveys, focus group discussions, and key informant interviews (KII). For the household survey, sampling size was determined using the Slovins formula at 95% level of confidence. A total of 480 farming households (126 in Brgy. Dy-Abra, Tumauini; 183 in Brgy. Masipi East, Cabagan; and 171 in Brgy. Limabuan, San Pablo) were randomly selected for the household interview.

The average household size in the three upland communities ranged from four in Masipi East and five in Dy-Abra and Limbauan. Farming was the major source of household income in these upland communities, which was supplemented by off-farming activities, particularly as farm labor. The average number of years of farming experience was longer in Dy-Abra than in the two communities. Household members involved in farming ranged from 2 to 3 members. The estimated mean annual income in the three farming communities ranged from P10,000.00 – P20,000.00. The farmers emphasized that their income is not enough to support the basic needs of their family.



Source: https://simplemaps.com/resources/svg-ph

Source: Isabela Provincial Development and Physical Framework Plan 2018-2023.

Figure 1. Location of Limbauan, San Pablo; Masipi East, Cabagan; and Dy-Abra, Tumauini.

Table 1. General profile of the communities.

Category	Project Site		
	Brgy. Dy-Abra, Tumauini	**Brgy Masipi East, Cabagan**	**Brgy. Limbauan, San Pablo**
Average household size	5	4	5
Sources of household income	Generally farming Non-farming (farm labor, employment, overseas worker, construction worker)	Generally farming Non-farming (farm labor, construction worker, overseas worker)	Generally farming Non-farming (farm labor, vendor, overseas worker, construction worker)
Number of years in farming	1-90 years	1-90 years	1-70 years

	Average: 25	Average: 22	Average: 20
Number of family members involved in farming	1-9 Average: 3	1-5 Average: 2	1-8 Average: 2
Estimated mean annual income from farming	P10,000.00 - P20,000.00	P10,000.00 - P20,000.00	P10,000.00 - P20,000.00

Meanwhile, the average landholdings of the farmers ranged from 1.09 to 1.32 hectares with the largest average farm area in Dy-Abra followed by Brgy. Limbauan and Brgy. Masipi East. In Limbauan, the majority of the farmers were tenants. They had a sharing agreement between the landowner and tenant called "tertia". Of the 100 sacks of corn harvested by the farmer, 25 sacks were shared to the landowner and 75 sacks to the farmer with all production costs shouldered by the farmer. On the other hand, Dy-Abra was classified as a Community-based Forest Management Area (CBFMA). Farmers as CBFM beneficiaries are the stewards of this government land under a tenurial agreement with the Department of Environment and Natural Resources (DENR). In Masipi East, some portions of the land cultivated by the farmers were under CBFMA, a government land tenure scheme while others were owned by the farmers. Farms were generally flat to rolling in the project sites except in Dy-Abra where farms had steep slopes. Corn was the major crop grown in the area with a monocropping system. Farmers in Masipi East also grew rice in small parcels of land of not more than one hectare. Farms especially corn areas were rainfed hence, these were more prone to drought shock over the past years. Farmers' produce were generally sold to traders within their municipality or adjacent municipality. Since the Municipality of San Pablo does not have its own market, farmers brought their produce to the traders in Tumauini and Cabagan.

Table 2. Farm description.

Category	**Project Site**		
	Brgy. Dy-Abra, Tumauini	**Brgy Masipi East, Cabagan**	**Brgy. Limbauan, San Pablo**
Average farm size (hectares)	1.32	1.09	1.23

Land ownership	Government land, owned, rented	Owned, government land, rented	The majority are tenants, government land
Farm topography	Flat to rolling, steep	Flat to rolling	Flat to rolling
Source of water for irrigation	Rainfall	Rainfall Irrigation for rice	Rainfall
Major farm component	Corn, rice, banana	Corn, rice, banana	Corn, rice, banana
Marketing of products	Traders in Tumauini and Cabagan	Traders in Tumauini and Cabagan	Traders in Tumauini and Cabagan

The shocks experienced by the farmers were climate change, including typhoons, drought and the Covid-19 pandemic. During the pandemic, farmers experienced limited supply of agricultural inputs such as seeds and fertilizers. Some of their preferred corn varieties and fertilizer (Vikings 46-0-0) were not available in the market. Prices of agricultural inputs increased by two to threefold. In Dy-Abra, there was an increase in farm labor and transportation cost. Meanwhile, in Masipi East, they had difficulty in hiring farm labor. This is because the pandemic had adversely affected their visits to their farms. On the other hand, farmers in Limbauan lacked capital to hire farm labor with no other source of off-farm income. Hence, farmers merely relied on family labor. Furthermore, farmers experienced low buying prices for their corn produce, from P17.00-P19.00/kg before the pandemic to only P10.00/kg during the pandemic. This forced them to sell their corn produce at very low prices to cover their borrowed capital and input from private individuals and traders. Due to high cost of inputs and limited off-farm livelihood, farmers were only able to till a portion of their farms while some farmers used limited fertilizers on their farms. These led to a decrease in their agricultural production and farm income.

Aside from the pandemic, climate change also had an impact on the farmers. The majority of them were aware of climate change and often described it as strong typhoons, drought, long periods of rain, and changing climatic patterns (wet and dry) which lead to unstable cropping patterns. Regarding their awareness of agroforestry, farmers in Limbauan lacked knowledge of agroforestry with only 3% of the population who were aware of agroforestry. Likewise, in Cabagan, only 26% of the population were knowledgeable about agroforestry. However, farmers were generally receptive to adopting agroforestry in their farms.

Table 3. Impact of the Covid-19 pandemic and farmers' knowledge and interest on climate change and agroforestry.

Category	Project Site		
	Brgy. Dy-Abra, Tumauini	**Brgy Masipi East, Cabagan**	**Brgy. Limbauan, San Pablo**
Impact of the pandemic on livelihood	Limited supply of inputs, increased price of inputs, increased labor and transportation cost, low buying price of corn	Limited supply of inputs, increased price of inputs, limited labor, low buying price of corn	Limited supply of inputs, increased price of inputs, depend on family labor, low buying price of corn
Knowledge of climate change	98.41%	84.15%	73.10%
Knowledgeable on agroforestry	87.99%	25.63%	2.92%
Interest rate on agroforestry adoption	95.00%	74.00%	60.00%

Appendix 3. Resiliency Level of Three Upland Farming Communities in Isabela Province.

Three (3) workshops were conducted to facilitate participatory resiliency assessment based on five capital assets for sustainable livelihood namely, financial, physical, natural, human, and social in Brgy. Masipi East, Cabagan, Brgy. Limbauan, San Pablo and Brgy. Dy-Abra, Tumauin (**Figure 1**). Participatory scoring of the various sustainable livelihoods resilience indicators was done through the analytical hierarchy process (AHP). Participants from the three sites were convened to provide weights based on the relevance of the different parameters of resilience. The weights of the indicators and sub-indicators were

measured vis-à-vis the results of the household survey to come up with the current level of resilience in the three upland communities.

Natural capital encompasses those essential to produce goods and services such as farms cultivated by the farmers and other natural resources within the community which are utilized for their livelihood. This indicator was measured in terms of farm size and diversity, soil fertility, and access to water sources. **Financial capital** refers to the financial resources utilized by the farmers to attain their livelihood objectives. This indicator was measured in terms of households' sources of income, i.e. income from farming, income from off-farm activities, income from non-farm activities, and access to credit multipurpose cooperatives. **Social capital** indicates relationships and networks among community members and between the community and outside organizations. This indicator was measured in terms of the communication and interaction among the community members, participation in community and group activities, and partnership with external organizations. **Physical capital** refers to basic infrastructure and producer goods needed to support the livelihood of the farmers. This indicator was measured in terms of ownership of farm tools and implements for farm development, postharvest facilities, machinery, and equipment. **Human capital** refers to the stock of competencies, knowledge, and personality attributes manifested in the ability to perform labor to realize economic value. Natural and financial capital were the two types of capital that the farmers in the three communities most commonly valued.

Results of the participatory scoring showed that the weights of resilience indicators varied across the three project sites. In Masipi East, Cabagan and Dy-Abra, Tumauini, natural capital was considered the most important factor in ensuring the resiliency of the farmers (**Table 1**). On the other hand, stakeholders in Limbauan, San Pablo identified human capital as the most important factor. Meanwhile, participants in Limbauan, San Pablo and Dy-Abra, Tumauini perceived social capital as the least important while human capital in Masipi East, Cabagan.

Figure 1. Participants of participatory resiliency assessment in (a) Masipi East, Cabagan (July 13, 20223); (b) Limbauan, San Pablo (July 14, 2023); (c) Dy-Abra, Tumauini (July 15, 2023).

Resiliency level of the three municipalities

Results of the analysis showed that the three upland farming communities had a low level of resiliency (**Figure 2**). This is in reference to the five indicators namely, social, human, financial, natural, and physical capital.

Table 1. Resiliency indices on five capital assets in Masipi East, Cabagan; Limbauan, San Pablo; and Dy-Abra, Tumauini.

INDICATORS	MASIPI EAST, CABAGAN	LIMBAUAN, SAN PABLO	DY-ABRA, TUMAUINI
Social Capital	**0.2893**	**0.0305**	**0.0173**
1. Active membership to POs	0.0444	0.0043	0.0031
2. Presence of immediate relatives	0.0229	0.0049	0.0009
3. Partnership with LGUs, development organizations and government agencies	0.0530	0.0042	0.0132
4. Institutional support (Training)	0.1697	0.0167	0.0028

Human Capital	**0.0260**	**0.4975**	**0.1139**
1. Access to health services	0.0036	0.2520	0.0189
2. Farming experience	0.0029	0.0279	0.0059
3. Knowledge in agriculture and CC	0.0073	0.1227	0.0180
4. HH size	0.0030	0.0308	0.0156
5. HH members active in farming	0.0032	0.0636	0.0516
Financial Capital	**0.2344**	**0.2028**	**0.3110**
1. HH members employed	0.0065	0.0331	0.0449
2. HH income	0.0207	0.0053	0.0298
3. Varied income sources	0.0392	0.0954	0.1514
4. Access to market	0.1287	0.0331	0.0722
5. Access to credit	0.0392	0.0331	0.0118
Natural Capital	**0.3787**	**0.1716**	**0.3193**
1. Farm size	0.0082	0.0090	0.0164
2. Farm terrain	0.0231	0.0034	0.0053
3. Crop diversity	0.0355	0.0151	0.0279
4. Soil condition	0.1382	0.0646	0.1155
5. Presence of perennial crops	0.0769	0.0325	0.0829
6. Access to water source (springs, rivers)	0.0951	0.0447	0.0708
Physical Capital	**0.0717**	**0.0976**	**0.2385**
1. Farm/land ownership	0.0104	0.0521	0.1261
2. Irrigation facility	0.0257	0.0229	0.0356
3. Farm machinery	0.0058	0.0120	0.0188
4. Storage facility	0.0024	0.0076	0.0062
5. Drying facility	0.0257	0.0025	0.0533
TOTAL	**1.0000**	**1.0000**	**1.0000**

The low level of resiliency in Limbauan, San Pablo was attributed to low membership to farmer organizations under **social capital**. There was also very minimal partnership between the organization and the community with external organizations. Hence, almost no assistance was extended to the community and farmer organizations. The majority of the farmers were unable to access technical assistance and capacity-building initiatives such as agriculture-related trainings. In Dy-Abra, Tumauini, the unavailability of a storage facility and functional irrigation system, insufficient farm machinery, and inadequate drying facility under **physical capital** contributed to the low level of resiliency of the community. On the other hand, in Masipi East, Cabagan, **human capital** particularly least number of average household size, limited household members involved in farming, and limited access to health services contributed to the low level of resiliency of the community. Moreover, the low **financial capital** scores in Masipi East and Limbauan were due to farmers' limited access to the market to sell their

produce. Farmers were forced to sell their produce to traders who lend them cash or agricultural inputs. Limited access to credit mainly from the traders or private individuals with at least 5-10% monthly interest also contributed to the low score of the community. Other indicators under natural capital such as less diversified farm with limited presence of perennial crops, poor or infertile farmland, unavailability of irrigation and limited access to water source contributed to the low level of resiliency in the three communities. The results suggest the need for a balanced and holistic approach to strengthening the resilience of the three upland farming communities, taking into account the current conditions of five resiliency indicators.

Table 2. Resiliency level of three upland farming communities.

PROJECT SITES	INDICATORS										Resiliency Index [c]
	Social Capital		Human Capital		Financial Capital		Natural Capital		Physical Capital		
	Weight [a]	Score [b]	Weight [a]	Score [b]	Weight [a]	Score [b]	Weight [a]	Score [b]	Weight [a]	Score [b]	
Brgy. Dy-Abra, Tumauini	0.0178	0.0185	0.1139	0.2160	0.3110	0.5333	0.3193	0.2817	0.2385	0.0791	0.2257 Low level
Brgy. Masipi East, Cabagan	0.2893	0.1277	0.0260	0.0346	0.2344	0.2751	0.3737	0.3263	0.0717	0.0206	0.1569 Low level
Brgy. Limbauan, San Pablo	0.0305	0.0051	0.4975	0.6639	0.2028	0.2568	0.1716	0.1059	0.0976	0.0254	0.2114 Low level

[a] weights computed using the Analytical Hierarchy Process (AHP)
[b] computed using the actual data (in scale) from farmer-respondents multiplied by the weight of each sub-indicators of the five (5) resiliency indicators
[c] average of the total scores of the five (5) resiliency indicators. The resiliency index is scaled as follows: 0.00-0.33 (low); 0.34-0.66 (moderate; and 0.67-1.00 (high)

Appendix 4. Training on Basic Agroforestry System Concepts and Establishment.

Rationale

The smallholder upland farmers in Isabela, Philippines are one of the most vulnerable sectors to external shocks such as pandemics, climate change, and natural calamities, particularly typhoons. Since external shocks are inevitable, it is important to strengthen the resilience of the agricultural sector, especially in developing countries such as the Philippines, particularly the vulnerable farmers in the upland farming communities. This can be done by redesigning their agricultural production systems that are based on the sustainable use of natural resources such as agroforestry system.

The goal of this module is to enhance the knowledge and attitude of upland smallholder farmers about the potential of agroforestry in promoting a sustainable farming system. The basic concepts and principles of agroforestry; classification of various agroforestry systems, the agroforestry system ecosystem services, and Agroforestry Land Capability Assessment and Mapping Scheme (ALCAMS) as methodology for assessing the land capability for agroforestry; agroforestry system design; soil and water conservation strategies and good agricultural practices of coconut as component of corn-based agroforestry system will be highlighted in this module.

Objectives

The training on basic agroforestry system concepts and establishment generally aims to enhance the knowledge and attitude of the upland smallholder farmers on the potential of agroforestry in promoting a sustainable farming system. Specifically, the training aims to:

1. Explain the basic concepts and principles of agroforestry;
2. Describe the different classifications of agroforestry systems;
3. Discuss the agroecosystem services of agroforestry systems;
4. Introduce ALCAMS as a tool for the assessment of land resources for agroforestry development;
5. Explain the basic guiding principles/considerations in the design of agroforestry system;
6. Determine the soil and water conservation strategies in agroforestry; and
7. Discuss the good agricultural practices (GAP) for coconut as a component of a corn-based agroforestry system.

Seventy-one (71) representatives from a government agency, provincial, municipal, and barangay LGUs and farmer organizations attended the three on-site trainings on basic agroforestry concepts and establishment. Meanwhile, 23 representatives from the City Environment and Natural Resources Office (CENRO) and Provincial Environment and Natural Resources Office (PENRO) of the Department of Environment and Natural Resources (DENR), Office of the Provincial Agriculturist (OPA), Environment and Natural Resources (ENRO) and Provincial Planning Department (PPDO) of the Provincial, Municipal and Barangay LGUs and Masipi East Upland Farmer Organization officers and members attended the training in Masipi East, Cabagan on 10 August 2022 (**Figure 1**). Likewise, 28 participants attended the on-site training with representatives from the Municipal and Barangay LGUs, officers and members of Ambavi Greeners Farmers Association in Limbauan, San Pablo on 11 August 2022 (**Figure 2**). Lastly, 20 participants with representatives from the Municipal and Barangay LGUs and members of the Sierra Madre Greeners Association attended the on-site training on 12 August 2022 in Dy-Abra, Tumauini (**Figure 3**).

Agroforestry concepts and principles, soil and water conservation strategies (SWCs) in agroforestry and agroforestry system design, establishment, management, and documentation were all covered by Dr. Jose Nestor M. Garcia, one of the project collaborators and the Director of the Institute of Agroforestry, College of Forestry and Natural Resources, University of the Philippines Los Baños (IAF-CFRN, UPLB). On the other hand, For. Adona Joanna Urmeneta from the College of Forestry and Environmental Management, Isabela State University (CFEM, ISU) Cagaban Campus, discussed the classification of agroforestry systems and existing agroforestry systems in the Philippines and other countries. Meanwhile, For. Ma. Armie Janica P. Ramirez, IAF-CFRN, UPLB provided a lecture and hands-on on Agroforestry Land Capability Assessment and Mapping Scheme (ALCAMS) as a tool for assessment of land resources for agroforestry development. Lastly, Dr. Chricept T. Villoria, Project Development Officer IV of the

Philippine Coconut Authority (PCA) handled good agricultural practices for coconut as a component of corn-based agroforestry systems.

Figure 1. Training on basic agroforestry system concepts and establishment in Masipi East, Cabagan, Isabela on 10 August 2022.

Figure 2. Training on basic agroforestry system concepts and establishment in Limbauan, San Pablo, Isabela on 11 August 2022.

Figure 3. Training on basic agroforestry system concepts and establishment in Dy-Abra, Tumauini, Isabela on 12 August 2022.

Appendix 5. Training of Trainers on Integrated Soil Fertility and Pest Management in Corn-based Agroforestry Systems.

Rationale

There are different types of agroforestry systems in the Philippines. The type of agroforestry system adopted by the farmers generally depends on the primary goals of the farmers, the capability of the land and the farmers, as well as institutional influences. In a corn-based agroforestry system, corn is the main crop component. Corn serves as the cash crop of the farmer while the perennial component provides economic as well as ecological services. For the corn-based agroforestry system to realize its full

potential, soil fertility in the said system must be maintained and improved. Moreover, pests and diseases of the components within the system must be managed through an integrated approach. Hence, this training on integrated soil fertility and pest management will be conducted.

The goal of this module is to enhance the knowledge of the upland smallholder farmers on integrated soil fertility and pest management in corn-based agroforestry systems. The basic concepts and principles of soil fertility and pest management, approaches to integrated soil fertility and pest management, and coconut pest management in corn-based agroforestry systems will be highlighted in this module.

Objectives

This training aims to enhance the knowledge of the upland smallholder farmers on integrated soil fertility and pest management. Specifically, the training aims to:

1. Explain the basic concepts and principles of integrated soil fertility and pest management;
2. Describe soil fertility management approaches;
3. Describe integrated pest management approaches; and
4. Discuss coconut pest management in corn-based agroforestry systems.

The Training of Trainers on Integrated Soil Fertility and Pest Management in Corn-based Agroforestry System was conducted on 25 November 2022 at the Bulwagan ng Sierra Madre, Environmental Information Center Building, ISU Cabagan Campus, Isabela. Fifty-two (52) representatives from the City Environment and Natural Resources Office (CENRO) and Provincial Environment and Natural Resources Office (PENRO) of the Department of Environment and Natural Resources (DENR), Office of the Provincial Agriculturist (OPA), Environment and Natural Resources Office (ENRO) and Provincial Planning Department Office (PPDO) of the Provincial Local Government Unit (LGU), Office of the Municipal Agriculturist (OMA), Municipal Environment and Natural Resource Office (MENRO), Barangay LGU officers, and officers and members of partner farmer organizations attended the said training (**Figure 1**).

Dr. Emerson V. Barcellano, Dean of the College of Forestry and Environmental Resources (CFEM), Isabela State University (ISU) Cabagan Campus and project collaborator, welcomed the participants (**Figure 2**). This was followed by a discussion of various topics by three resource persons from different institutions and government agencies. Topics covered during the training were Soil Fertility Management by Dr. Jose Nestor M. Garcia, Director of the Institute of Agroforestry, College of Forestry and Natural Resources, University of the Philippines and project collaborator (**Figure 3**); Integrated Pest Management by Mr. Saderi G. Ramel, Instructor at the College of Agricultural Sciences and Technology (CAST) ISU-Cabagan Campus (**Figure 4**); and Coconut Pest Management in Corn-based Agroforestry System by Dr. Chricept T. Viloria, Project Development Officer IV of the Philippine Coconut Authority (PCA) (**Figure 5**).

Figure 1. Participants and speakers during the Training of Trainers on Integrated Soil Fertility and Pest Management in Corn-based Agroforestry System.

Figure 2. Welcome remarks delivered by Emerson V. Barcellano (ISU).

Figure 3. Soil fertility management by Dr. Dr. Jose Nestor M. Garcia (UPLB).

Figure 4. Integrated pest management by Mr. Saderi G. Rame (ISU).

Figure 5. Coconut pest management in corn-based agroforestry system by Dr. Chricept T. Viloria (PCA).

Appendix 6. Agroforestry Program and Policy Analysis in the Municipalities of Cabagan, Tumauini, and San Pablo, Isabela: A Self-Assessment Workshop.

Rationale

The project entitled, "Resilience-Building Among Smallholder Farmers of Selected Upland Farming Communities in the Province of Isabela, Philippines" is funded by the Asia-Pacific Network for Global Change Research (APN). It is being implemented by the University of the Philippines Los Baños-Institute of Agroforestry (UPLB-IAF) and the Isabela State University (ISU), Cabagan Campus in collaboration with the LGUs and the Department of Environment and Natural Resources, Provincial Environment and Natural Resources Office, Isabela (DENR-PENRO), and City Environment and Natural Resources Office (CENRO). The project aims to improve the resilience of smallholder upland farmers in Isabela who are considered vulnerable to external shocks/risks such as pandemics, climate change, and natural calamities. Since external shocks are inevitable, it is important to strengthen the resilience of the agricultural sector, especially in developing countries like the Philippines, particularly its upland farming communities. This can be done by redesigning their agricultural production systems that are based on the sustainable use of natural resources such as agroforestry systems. Therefore, it is important to determine the current status of agroforestry programs and policies in selected municipalities as well as the gaps, issues, and concerns. This APN-funded project employs a participatory approach thus, the evaluation of the current state of the agroforestry program and policy was done using the self-assessment workshop. This information will be the basis for policy recommendations that can be a tool for project collaborators and stakeholders in lobbying with local policymakers towards mainstreaming agroforestry programs in their local development programs/agenda.

Objectives

The workshop aims to:

1. Evaluate the status of agroforestry program and/or policy in Cabagan, Tumauini and San Pablo, Isabela;

2. Determine the strengths and weaknesses of stakeholders in implementing agroforestry program/agenda in local development program;

3. Identify the opportunities and threats in implementing agroforestry programs/agenda in local development programs; and

4. Formulate policy recommendations for effective and efficient implementation of agroforestry program/agenda of LGUs and agencies in the Province of Isabela.

The policy analysis workshop was conducted at the Bulwagan ng Katutubo, Environmental Information Center Building, ISU Cabagan Campus, Isabela on 19 April 2023. Eighteen (18) representatives from the City Environment and Natural Resources Office (CENRO) and Provincial Environment and Natural Resources Office (PENRO) of the Department of Environment and Natural Resources (DENR), Office of the Provincial Agriculturist (OPA), Environment and Natural Resources Office (ENRO) and Provincial Planning and Development Office (PPDO) of the Provincial Local Government Unit (LGU), various offices of the Municipal LGU (Municipal Agriculture, Municipal Environment and Natural Resources, Municipal Planning and Development), Barangay LGU, Masipi East Upland Farmer Organization, Sierra Madre Farmers Association, and Ambavi Greners Association attended the workshop (**Figure 1**). Dr. Emerson V. Barcellano, Dean of the College of Forestry and Environmental Resources (CFEM), Isabela State University (ISU) Cabagan Campus and project collaborator, welcomed the participants (**Figure 2**).

A self-assessment workshop was undertaken to assess the current conditions of the agroforestry program, project, and policy in Masipi East, Cabagan; Limbauan, San Pablo; and Dy-Abra, Tumauin (**Figure 3**). Self-assessment focused on SWOT analysis (strengths and weaknesses to include gaps, opportunities, and threats) regarding the current status of agroforestry program and policy of LGUs and government agencies in the Province of Isabela. The objective of the workshop is to formulate policy recommendations to enhance the resilience of smallholder upland farmers in Isabela through effective and efficient implementation of agroforestry programs/agenda of LGUs and agencies in the Province of Isabela. The stakeholders drafted strategies that will help overcome identified weaknesses and threats and maximize and improve the strengths and opportunities towards achieving their main goal. The policy recommendations will serve as a tool for project collaborators and stakeholders in lobbying with the local policymakers towards mainstreaming agroforestry programs in their resilient-building agenda or development programs. Among the recommendations by the stakeholders were clear designation of office with technical staff at the Municipal LGU that will spearhead the implementation of agroforestry program/agenda, craft resolution for agroforestry program by the LGU, harmonize agroforestry program/project within various levels of LGUs from provincial down to barangay level and allocation of funds by LGU for the agroforestry program or agenda.

Figure 1. Participants of the policy analysis.

Figure 2. Participants of the policy analysis workshop welcomed by Dr. Emerson V. Barcaellano.

Figure 3. Participants during the self-assessment workshop.

Appendix 7. Dissemination Workshop: Sharing of Outputs, Lessons, Best Practices, and Policy Recommendations of Resilience-Building Among Smallholder Farmers of Selected Upland Farming Communities in the Province of Isabela, Philippines Project.

Rationale

The project entitled, “Resilience-Building Among Smallholder Farmers of Selected Upland Farming Communities in the Province of Isabela, Philippines” is being implemented by the University of the Philippines Los Baños-Institute of Agroforestry (UPLB-IAF) and the Isabela State University (ISU), Cabagan Campus in collaboration with the LGUs and the Department of Environment and Natural Resources, Provincial Environment and Natural Resources Office, Isabela (DENR-PENRO), and City Environment and Natural Resources Office (CENRO). This capacity development project is funded by the Asia-Pacific Network for Global Change Research (APN). The primary goal of the project is to improve the resilience of smallholder upland farmers in Isabela who are considered vulnerable to external shocks/risks such as pandemics, climate change, and natural calamities.

The output of the policy analysis workshop and lessons learned by the multi-stakeholders were compiled and initial recommendations were put forward. Representatives of the peoples’ organization (PO) member farmers, local government unit officials from barangay, municipal, and provincial levels, and DENR representatives participated in the dissemination workshop. This workshop aims to present/disseminate the output of the project and raise awareness on the importance of building the resiliency of smallholder farmers in the upland communities. These recommendations will be presented to the stakeholders and firmed up which will serve as input for policy recommendations that can be a tool for project collaborators and stakeholders in lobbying with local policymakers towards mainstreaming agroforestry programs in their local development programs/agenda.

Objectives

This workshop aims to:

1. Present the outputs and findings of the project;
2. Disseminate the project’s best practices and lessons learned by the stakeholders; and
3. Formulate policy recommendations for effective and efficient implementation of agroforestry program/agenda of LGUs and agencies in the Province of Isabela.

Twenty-eight (28) representatives from the City Environment and Natural Resources Office (CENRO) and Provincial Environment and Natural Resources Office (PENRO) of the Department of Environment and Natural Resources (DENR), Office of the Provincial Agriculturist (OPA), Environment and Natural Resources Office (ENRO) and Provincial Planning and Development Office (PPDO) of the Provincial Local Government Unit (LGU), various offices of the Municipal LGU (Municipal Agriculture, Municipal Environment and Natural Resources, Municipal Planning and Development), Barangay LGU, Masipi East Upland Farmer Association, Sierra Madre Greeners Association, and Ambavi Greeners Farmers Association attended the

dissemination workshop at the Bulwagan ng Katutubo, Environmental Information Center Building, ISU Cabagan Campus, Isabela on 22 September 2023 (Figure 1).

Figure 1. Participants of the dissemination workshop.

Dr. Emerson V. Barcellano, Cluster Executive, Isabela State University (ISU) Cabagan Campus and project collaborator, welcomed the participants (Figure 2). Ms. Nemesis Ocampo, Project Leader, presented project outputs and findings for two years. Three (3) model farm cooperators shared their insights as well regarding the model farms developed in the three sites. The cooperators emphasized that through the integration of perennial crops in their corn production areas, their income will increase once these perennials have matured and start to bear fruit. They are no longer dependent on a sole crop, which makes them more vulnerable to shocks such as drought and typhoons which they commonly experienced (Figures 3-5).

Figure 2. Participants of the Dissemination Workshop welcomed by Dr. Emerson V. Barcellano.

Figure 3. Mr. Dominador Balucas Abiqui

Figure 4. Mr. Lovino Rambac

Figure 5. Mr. Dante

Meanwhile, For. Rowena Esperanza D. Cabahug, IAF OIC Director, presented the best practices, lessons learned, and initial recommendations (Figure 6). These were confirmed and validated by the participants of the workshop. Furthermore, For. Adona Joana Urmeneta, ISU Cabagan Faculty, facilitated a workshop to further enrich these initial recommendations. The group was divided into three sub-groups namely, LGUs, DENR, and POs to come up with the

best practices, lessons learned, and recommendations towards mainstreaming agroforestry programs in the LGU's resilient building agenda.

Figure 6. For. Rowena Esperanza D. Cabahug, IAF OIC Director presenting the lessons learned, best practices and initial policy recommendations

Best Practices and Lessons Learned

1. Formation of multi-stakeholder group and collaboration among multi-stakeholders (UPLB, ISU-Cabagan, DENR-PENRO/CENRO, Barangay, Provincial, and Municipal LGUs, and POs) during the entire project cycle. A wider range of ideas and perspectives can be accessed by including a broader spectrum of people in the planning and implementation process.

2. Active engagement of the LGUs (i.e. barangay, municipal, and provincial levels) in project implementation through various units such as the Office of the Municipal/Provincial Agriculturist, Office of the Municipal/Provincial Environment and Natural Resources Office, and the Office of the Municipal/Provincial Planning and Development Office). Build trust between the LGUs and the community and create a strong base for future resilient-building intervention in the community.

3. Participatory approach: development of selection criteria (project sites, AF model farm), assessment, planning, implementation and monitoring. Stakeholders have a fundamental right to participate in the decision-making processes that have an impact on their future. Participatory approach creates a sense of ownership and motivation, inclusion, empowerment and ultimately, sustainability.

4. Through Agroforestry Land Capability Mapping Schemes (ALCAMS), agroforestry land capability can be assessed using a scientific method.

5. Agroforestry system models co-designed and co-developed by the multi-stakeholders. This ensures that the agroforestry model design is relevant and acceptable to the farmer-cooperator as joint decision-making is in place. This is an underlying element of sustainability.

6. Active engagement of DENR PENRO/CENRO in CBFM communities particularly Masipi East, Cabagan and Dy-Abra, Tumauini. This reduces intervention overlap in the community by various organizations/institutions and fosters project effectiveness and efficiency.

7. Benchmarking the resiliency level and socioeconomic characteristics of the three project sites would serve as basis for assessing the project impacts after five years of project implementation.

8. Capacity-building for the core group represented by farmers and LGU technicians on (1) Basic Agroforestry System Concepts and Establishment and (2) Integrated Soil Fertility and Pest Management in Corn-based Agroforestry System. This helps farmers and technicians to better understand and appreciate the value of agroforestry. Improved technical capabilities provide farmers and LGU technicians the confidence and ability to promote agroforestry in their locality.

The policy recommendations would serve as an instrument for project collaborators and stakeholders in lobbying with the local policymakers towards mainstreaming agroforestry programs in their resilient-building agenda or development programs. These are as follows:

1. Integrate ALCAMS as a tool in the design and development of agroforestry farms in upland farming communities especially in areas designated for agroforestry development in the respective LGU's Comprehensive Land Use Plan.

2. Identify and integrate appropriate perennial components in corn-based agroforestry systems.

3. Integrate soil and water conservation technologies in agroforestry systems in sloping areas to balance the economic and ecological benefits of the agroforestry system in upland farming communities in Isabela.

4. Emphasize economic returns and ecological services of agroforestry systems to include control of soil erosion and enhancement of biodiversity.

5. Institute local policies through barangay/municipal resolution/ordinance to:

a. Allocate funds from the LGU for the implementation of agroforestry projects/programs together with the DENR and other organizations in upland farming communities.

b. Designate an office with technical staff at the Municipal LGU that will spearhead the implementation of the agroforestry program/agenda.

c. Actively involve the Barangay and Municipal LGUs in the planning, implementation, monitoring, and evaluation together with the POs/farmers/communities.

d. Harmonize agroforestry programs/projects within various levels of LGUs from provincial down to barangay level.

6. Barangay and Municipal LGUs to tap Provincial LGU and other organizations/individuals for funding support to facilitate implementation of agroforestry projects/programs.

7. The core farmers and LGU technicians trained should proactively take the lead in the active promotion of agroforestry systems in their respective areas.

Appendix 8. Corn-based Agroforestry System Models in Selected Upland Farming Communities in the Province of Isabela, Philippines.

One of the most significant components of the Asia Pacific Network for Global Change (APN)-funded project entitled "Resilience-building Among Smallholder Farmers of Selected Upland Farming Communities in the Province of Isabela, Philippines" is the development and establishment of appropriate agroforestry models. This project was implemented by the University of the Philippines Los Baños -Institute of Agroforestry (UPLB-IAF) and the Isabela State University (ISU), Cabagan Campus in collaboration with the LGUs and the Department of Environment and Natural Resources - Provincial Environment and Natural Resources Office, Isabela (DENR-PENRO), and City Environment and Natural Resources Office, Cabagan (CENRO).

The Philippines' hilly and mountainous terrain contributes significantly to soil erosion which is the main cause of land degradation in the country, according to the Bureau of Soils and Water Management (BSWM). Upland areas with slopes greater than 18% make up around 17.6 million hectares (59%) of the Philippines' total land area (30 million hectares). Corn monocropping is predominantly practiced in upland farming communities in Isabela province. Hence, the sloping upland farms in these communities are vulnerable to soil erosion. Upland farming communities can help restore and stabilize these landscapes with the adoption of agroforestry systems and techniques.

Three (3) model farms were selected for the establishment of appropriate agroforestry model based on agreed-upon criteria by the multi-stakeholders in Brgy. Dy-Abra, Tumauini, Brgy. Masipi East, Cabagan and Brgy. Limbauan, San Pablo in Isabela. The agroforestry model farm development was co-developed with the farmers organizations in the three sites namely, Sierra

Madre Greeners Association in Dy-Abra; Masipi East Upland Farmers Association in Masipi East; and Ambavi Greeners Farmers Association in Limbauan. Agroforestry Land Capability Assessment and Mapping Scheme (ALCAMS) was conducted in these areas to evaluate the capability of the land for agroforestry development. The slope (S), vegetation (L), and soil fertility (F) in these selected areas were assessed and classified based on the ALCAMS method. Results showed that these areas belong to class II or marginally capable of agroforestry (**Table 1**). Slopes in these model sites were classified as undulating to rolling (8%-18%) to rolling to moderately steep (18%-30%). On the other hand, soil textural class in Brgys. Dy-Abra and Masipi East was sandy clay loam while sandy clay in Brgy. Limbauan. Agroforestry models were designed, established, and maintained by the multi-stakeholders. These models will serve as show window of agroforestry systems and practices in the community. Hybrid coconuts (*Cocos nucifera*) from the Philippine Coconut Authority (PCA) were integrated into the three model farms with corn (**Figure 1**). These hybrid coconuts are expected to mature and produce nuts in three to four years compared to the tall varieties typically grown on farms which mature in seven years. Moreover, Philippine lime (*Citrus x microcarpa*) was integrated into a corn-based agroforestry model farm in Masipi East, Cabagan (**Figure 2**). Hedgerows of Madre de cacao (*Gliricidia sepium*) were planted along the contour lines in Masipi East, Cabagan and Dy-Abra, Tumauini **(Figures 2-3**) to control/minimize soil erosion in these sloping farms.

Table 1. Result of Agroforestry Land Capability Assessment and Mapping Scheme (ALCAMS).

Factors	Agroforestry Model Farm		
	Brgy. Dy-Abra, Tumauini[a]	**Brgy. Masipi East, Cabagan[b]**	**Brgy. Limbauan, San Pablo[c]**
Slope	10-20 (S_2)	0-33 (S_3)	15 (S_1)
Vegetation	Cultivated (L_3)	Cultivated (L_3)	Cultivated (L_3)
Soil fertility	Low (F_3)	Low (F_3)	Low (F_3)
pH	4.0	4.6	4.3
OM (%)	3.46	3.53	3.48
P (mg/kg)	4.5	9.4	2.7
K (cmol/kg soil)	0.19	0.45	0.59

Soil textural class	Sandy clay loam	Sandy clay loam	Sandy clay
Classification	Class II – Marginally capable for agroforestry	Class II – Marginally capable for agroforestry	Class II – Marginally capable for agroforestry

a Mr. Dominador E. Balucas' farm

b Mr. Lovina "Alex" A. Rambac's farm

c Mr. Dante B. Abiqui's farm

Figure 1. Mr. Dante B. Abiqui, farmer-cooperator of corn-based agroforestry model farm in Brgy. Limbauan, San Pablo, Isabela.

Figure 2. Mr. Lovino "Alex" A. Rambac, farmer-cooperator of corn-based agroforestry model farm in Brgy. Masipi East, Cabagan, Isabela.

Figure 3. Mr. Dominador "Doming" E. Balucas, farmer-cooperator of corn-based agroforestry model farm in Brgy. Dy-Abra, Tumauini, Isabela.