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Agroforestry Practices in Kinama, Rizal, Kalinga: A documentation and basis for intervention plan

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Abstract— *This study was conducted to document the Agroforestry Practices in Kinama, Rizal, Kalinga.A documentation and basis for intervention plan from September05 to September 30, 2022. There were 102 respondents of the study. The descriptive statistics was used. Frequency counts, percent, means, ranks and correlation analysis were used in the analysis and interpretation of data. Results of the study showed that most of the respondents are males and married. Many of the respondents belong to age bracket 41 to 50 years and attained elementary level. All the respondents are owner-operators and less than half have six to eight years' experience in Agroforestry farming: cultivating an area of 1 to 5 hectares Many of the respondents earned Php 9,000 and above after adopting Agroforestry. Almost all of the respondents practiced multi-storey with tree components of yemane, mahogany, mango, citrus, rambutan, lanzones and coffee. The integrated agricultural crops are pigeon pea, banana, corn and eggplant. The respondents are moderately benefitted in terms of economic and environmental benefits and also fairly benefitted in cultural benefits. Results showed that the degree of seriousness of the overall problems encountered were fairly serious with a mean of 2.26. However, poor location was rated as the highest and the non-ownership of land and unstable tenure status was claimed not serious with the lowest rating. The correlation analysis was found to have no significant relationship of income derived from agroforestry farming to educational attainment and years of farming of the farmer-respondents.*

Keyword— ***Agroforestry farming practices, land tenure, multi-storey, intervention plan, documentation***

I. INTRODUCTION

Background of the Study

The Philippines is considered as one of the biodivsersity hot spots in the world due to its unique flora and fauna. Just like in many parts of the world, Philippines is also experiencing forest destruction (deforestation and/or forest degradation). These consequently pose a great threat to the stability of the whole ecosystem (Dulay, 2015).

Philippine forest covers have degenerated because of massive logging activities, extreme poverty and shifting cultivation. Current deforestation rate has been estimated at 100,000 ha per year. There are about 20 million Filipinos living in upland watershed areas, half of whom are dependent on shifting cultivation for livelihood. The continuous influx of migrant communities has further aggravated the diminishing forest resources. Given the dependence of human and social life of products from the forest from wood to water and to the oxygen they produce, these consequences impinge on all sectors of the society (Mapili, 2019).

Agroforestry is so far one of the solutions to ecological degradation. There is now a worldwide acceptance of agroforestry as the most appropriate technological approach to improve the upland areas. In Cordillera Administrative Region (CAR), agroforestry development was listed in the Regional Development Plan of 2004-2010 as one of the programs that will support the watershed cradle (Latap, 2015).

Upland agroforestry systems have been proven to have a positive impact on smallholders' livelihoods: they contribute to economies from local through to global and also provide valuable environmental services. However, these systems are often overlooked and face several major

barriers. Upland smallholders are particularly vulnerable to the threats of climate change, notably, erratic rainfall patterns and more frequent extreme weather. Consequently, upland populations are increasingly migrating to urban areas where opportunities are perceived to be better. However, with improved support, upland farmers can enhance their agroforestry systems and livelihoods and thereby strengthen local through to global economies and also enhance environmental services (Roshetko et al., 2017).

Cordillera Administrative Region (CAR) is blessed with abundant natural resources like wide forest cover and as such, it is aptly called the "watershed cradle of Northern Luzon". However, the region is now confronted with an imbalance between the productive and protective uses of the watersheds. Socio-economic pressures have forced upland dwellers to farm even steep slopes, and even to the extent of converting forest lands for agricultural purposes (Latap, 2015).

The province of Kalinga is surrounded by mountains and divided into three distinct geographical areas, with the Chico River as the center: the mountainous western portion; the valley of the river and its tributaries; and the plains between the river and Cagayan Province. Most of the residents grow crops and livestock for domestic needs and income.

Agroforestry has always been a part of the Ykalingas' traditional farming practices. They usually grow root crops and rice on slopes, supported by trees, which in turn prevent soil erosion. Animal waste and leftover food are used as fertilizers. Some tribes in the province plant high-value crops alongside nitrogen-fixing plants, such as peanuts and beans.They also use land-management systems in which trees and shrubs are grown around or among crops or pastures. With this system, they are able to make the production of food, firewood and clothing sustainable (Berry, 2020). According to Domoguen (2018), Agroforestry is best for mountainous regions like Cordillera. The practice of agroforestry in Kalinga Province, Philippines is a tradition that has been passed from generations to generations and has become a way of life to the people of Kalinga (Bayon et al., 2016).

The municipality of Rizal is called the gateway to the provincial capital, the city of Tabuk. It is situated along the provincial boundaries of Kalinga, Cagayan and Isabela. Rizal has a total land area of 23,011 hectares composed of valleys and hills. Its fertile clay soil is best suited for crops and rice production. On its western sides are grazing lands and patches of forest. The town's major source of livelihood is agriculture. Monocropping is widely used in the municipality. Rice and corn farming are the most dominant and only few are engage in vegetable production.

Rizal is an agriculture-based municipality because of its favorable topography. The barangays of Bulbul, Kinama, San Pedro and San Francisco belong to the upland communities of the municipality. These barangays practiced slash and burn and even converting the grassy and rocky hills to corn plantation. This made possible when upland farmers recognized the power of herbicides which makes the soil friable and the stones were rapidly weathered (Balbuena & Javillonar, 2018).

One peculiarity of agroforestry farming systems is their being location-specific. Because of the presence of diverse cultural communities in the province, a number of indigenous agro- forestry farming systems have also been developed in other localities but remained undocumented.

The need of documentation therefore is necessary before it will get lost forever or forgotten if not properly documented, analyze and disseminated. Knowledge gained but is unavailable to others is wasted https://digital;commons.unL.edu/libphilprac (2017).

The Philippines is still primarily an agricultural country of which most citizens still live in rural areas and support themselves through agriculture. Filipino farmers still uses traditional way of farming because of its benefits in sustaining the capacity of the soil to produce healthy and organic crops using available resources .This is the type of farming that prevailed in the Philippines before the coming in of mechanized and chemical farming. However, some of these indigenous or traditional farming practices still remained undocumented particularly within the upland communities.

This local knowledge developed in the community through time is very important in achieving sustainable agriculture and food security. It's essential in maintaining farm productivity, efficiency and profitability in the long run, without depleting the natural resources and the environment. It is therefore imperative to create awareness and bring critical issues relating to the documentation and dissemination of agricultural indigenous knowledge to the policy makers so that its potentials can be harnessed to achieve sustainable food production to combat food crisis.

Documentation is one of the means of preserving indigenous knowledge for posterity, national growth and sustainable development. Access to relevant information has been documented as crucial to the economic, political, and social well-being of any community. It is believed that indigenous knowledge has much to offer and teach the world at large and only by research and documentation can

it be preserved and made available to development workers worldwide.

Since agroforestry practices within the Municipality of Rizal, Kalinga remained undocumented as observed and witnessed by the author himself being a resident, prompted him to document these practices particularly agroforestry farming within Kinama, Rizal, Kalinga before these practices disappear or vanish that will curtail knowledge growth.

Further, the study will serve as baseline information on the agroforestry farming practices adopted by the farmer-respondents that can be used by researchers, extensionists and policy makers on the identified strength, weaknesses, and opportunities as reference in improving and addressing the needs of the farmer-adopters to pursue sustainable agroforestry farming among the people of the municipality of Rizal, Kalinga and other interested individuals and neighbouring communities.

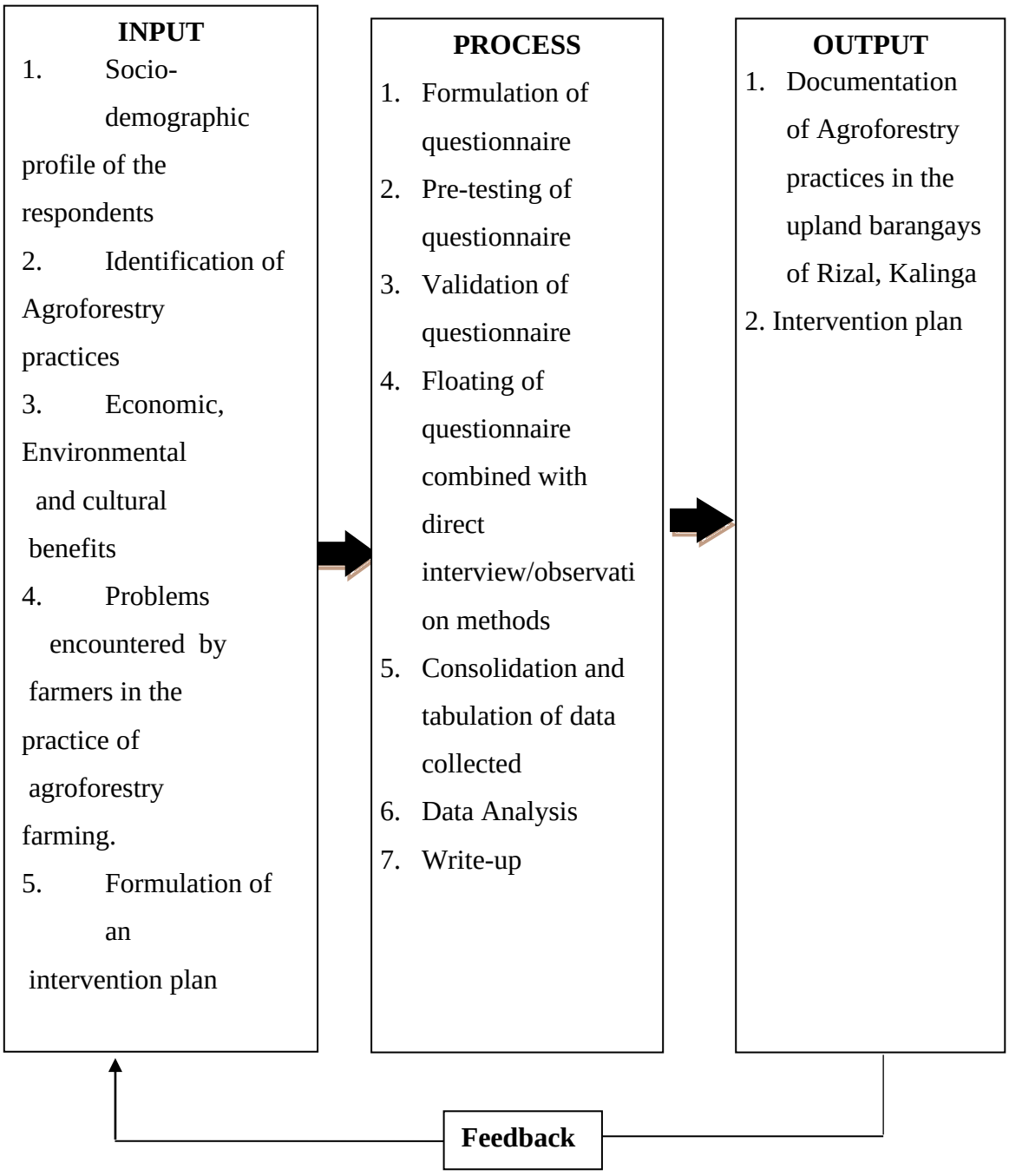

Fig. 1. Framework of the Study. This study will beguided by the Input-Process-Output (IPO Model) (Fig. 1) for the documentation of agroforestry practices among upland farmers in Rizal, Kalinga. It was conceptualized to address the need of the upland farmers and evaluate their agroforestry farming practices. The input of study includes

the socio-demographic profile, identification of agroforestry practices, economic and environmental and cultural benefits of agroforestry and the problems encountered by the farmers in the practice of agroforestry farming.

The process involved the formulation of questionnaire, pre-testing and floating of questionnaires combined with direct interview and observation method, survey and presentation of data gathered and the analysis of data.

The outputs were the documentation of agroforestry practices adopted in the upland barangays of Rizal, Kalinga and a proposed/recommended intervention plan.

Statement of the Problem

Generally, the study aimed to document the Agroforestry practices in Kinama, Rizal, Kalinga.

Specifically, it aimed to answer the following questions:

1. What are the socio-demographic profile of the respondents?

2. What are the identified agroforestry practices in Kinama, Rizal,

Kalinga?

3. What are the economic, environmental and cultural benefits of agroforestry farming practices adopted by farmers?

4. What are the problem encountered by farmers and the perceived solutions in the practice of agroforestry?

5. What is the correlation analysis between the following?

a. income and educational attainment; and

b. income and years of agroforestry practice.

6. What is the recommended intervention plan to be designed to have sustainable agroforestry farming practices in the Kinama, Rizal, Kalinga?

Significance of the Study

This study sought to provide additional information to the farmers for good quality farming. This will also provide the municipality baseline information on the farmers who are practicing agroforestry farming. The result of this study will serve as the baseline data and information for researchers, extension agents and policy makers to improve agroforestry practices among the people in the Municipality of Rizal, Kalinga.

Scope and Delimitation of the Study

The study focuses on the Agroforestry Practices in Kinama Rizal, Kalinga: economic, environmental and cultural benefits of agroforestry farming practices adopted by farmers and recommended intervention plan to be designed to have sustainable agroforestry farming practices in the Kinama, Rizal, Kalinga.

II. REVIEW OF RELATED LITERATURE

According to Obura, (2018), the basic component of any country's agricultural knowledge system is its agricultural indigenous knowledge (AIK) that encompasses the skills, experiences and insights of people, applied to maintain or improve their livelihood. Many authors have recognized AIK as an important source of developmental information (Anyira, 2010) and have recommended its proper documentation and dissemination for sustainable agricultural development.

Kudakwashe & Gift, (2013) also consider traditional indigenous /agricultural knowledge as a knowledge that is unique to a given culture, community or society that is different from the knowledge learned from formal institutions. It encompasses all aspects of life, such as the management of natural environment. It forms the basis of survival for the people who own the knowledge. Moreover, IK and practice are usually unwritten relying on oral transmission and human memory, therefore, the importance documentation (Abebayo and Adeyemo, 2017). Additionally, is its scientific validity because modern agriculture could learn a lot from it (Zaid and Egberongbe, 2011). It is believed that indigenous knowledge has much to offer and teach the world at large and only by research and documentation can it be preserved and made available to development workers worldwide.

According to Fransen (2020), Agroforestry is an economically and ecologically sound practice that incorporates cultivation, conservation and tree planting alongside crops or livestock farming. Agroforestry practices come in many forms but fall into two groups-those are sequential, such as fallows, and those that are simultaneous, such as alley cropping (Leaky, 2017). In particular, agroforestry is crucial to small holder's farmers and other rural people because it can enhance their food supply, income and health. It is a multifunctional system that can provide a wide range of economic, sociocultural and environmental benefits (FAO, 2015). Agroforestry is likened to a principle that is well accepted by many forest and hill-side farmers in tropical regions (Luna, 2018). It increases or sustains productivity while maintaining the ecological stability of the environment (Gacutan, 2012). According to Gangadharappa et al. (2003), the

approximate annual returns of one acre of agroforestry plot is averaging of $ 800 or Rs 31466.20 which is much profitable than any traditional crop.

Agroforestry systems have the potential to address both food insecurity and carbon mitigation goals. Agroforestry is a system in which trees and different crops are merged together in the same area for net economic return to farmers. Agroforestry has been identified as a potential greenhouse gas mitigation and afforestation approach under the Kyoto protocol. Average carbon storage by agroforestry system is estimated at 9, 21, 50 and 63 Megagrams C/ha/year in semiarid, sub-humid, humid and temperate regions respectively (Yasin et al. 2019). Agroforestry also strengthens farmers' adaptive capacity to counter climate change impacts by building more resilient agricultural systems and diversifying income sources. Also importantly to farmers, agroforestry contributes to food security by providing multiple products and benefits to farmers such as food, fodder and shade for livestock, timber and renewable wood energy.

Agroforestry is an intensive land management system that integrates trees into land already used for crop and animal farming. It is an important approach to improve the environmental, economic, and social benefits of complex social–ecological systems in the Asia-Pacific region (Shinet al., 2020).

Agroforestry bridges the gap that often separates agriculture and forestry by building integrated systems that address both environmental and socio-economic objectives. Agroforestry can improve the resiliency of agricultural systems and mitigate the impacts of climate change (Brownet al.,2018).

Interactions between trees and other components of agriculture such as livestock, fishery and aquatic species is important at a range of scales: in fields (where trees and crops are grown together), on farms (where trees may provide fodder for livestock, fuel, food, shelter or income from products, including timber) and landscapes (where agricultural and forest land-uses combine in determining the provision of ecosystem services(SEARCA,2021).

Finleyet al. (2018) cited that one of the agroforestry systems such as intercropping can be used to increase crop yields through resource partitioning and facilitation in addition to achieving greater productivity.

To improve the livelihood and nutrition status of the people of the Philippines and the world as well, the viable agricultural solution to this problem is to adopt the practice of agroforestry systems. Agroforestry is the combination of agriculture and forestry practices within a farming system. It involves the combination of trees and crops that increase the medicinal, environmental, and economic value of land with much profit and food security (Sobola et al., 2015).

Among the agroforestry systems that would be an effective tool to solve the problems mentioned above is the practice of intercropping.

Few studies have been conducted to examine the benefits of adopting agroforestry technologies; however, of the studies conducted, the results show that there are significant benefits for land owners adopting agroforestry. This premise is supported by Jacobson and Kar (2013), who conducted a similar study and reported “A review of the literature on agroforestry extension adoption in the United States finds only a few examples”.Furthermore, limited-resource farmers are faced with the challenge of making their farm business economically viable,

III. METHODOLOGY

Locale of the Study

The study was conducted at Kinama, Rizal, Kalinga from November to December 2022.

Research Design

The descriptive statistics such as mean, frequency counts and percentage will be used in this study. A structured interview will be utilized to gather relevant data. Likewise, field observation and documentation will be employed in this study.

Respondents of the Study

The respondents of the study were the Agroforestry farmers particularly in Kinama, Rizal, Kalinga.

Instrumentation

Prior to the conduct of this study, request letter was sent to the Barangay Captain of Kinama, Rizal, Kalinga for permission and assistance in the conduct of the study. Survey questionnaire will the main instrument of the study.

To ensure reliability and validity of the questionnaires, pre-testing will done at barangay San Francisco, Rizal, Kalinga with eight farmers as respondents which were no longer considered in the identification of respondents. A structured questionnaire and interview schedule will be done to collect data in this study. The questions that are hard to be understood by the respondents will be translated to local dialect by the researcher during the interview to facilitate the discussions and encourage more responses from the farmers. After the interview, actual field visitation was conducted for validation vis-à-vis the collected information provided by

the respondents. Observations will be done to take note of the practices adopted by the agroforestry farmers. Sample photos were taken from the agroforestry farms of the farmers serve as pieces of evidence on the type of agroforestry farming practices adopted by the respondents.

The data to be collected were as follows: 1. socio-demographic profile of respondents; 2. identification of the agroforestry farming practices of the respondents; 3. economic, environmental and cultural benefits of agroforestry and; 4. problems encountered by the respondents in agroforestry farming practices.

Data Gathering Procedure

The study was a descriptive research design. Face-to-face interviews with the respondents will be conducted using the interview guide questionnaire. The content of the questionnaire survey is the level of awareness and their practices pertaining to the solid waste management and the effectiveness of campaigns and program of the Local Government Unit. It was explained to the respondents before answering. The purpose of the interview was to verify the information that the respondents will give about:

A. Level of Participation/Involvement of Respondents to the CBFM Activities
B. Degree of Seriousness of the Problems Encountered by the Respondents

Actual observations and site visits will be done to validate the answer of respondents.

Data Analysis

The data collected/gathered were tallied, tabulated and analysed using the descriptive statistics such as frequency counts, mean and percentage.

The following rating scale and descriptive equivalent will be used:

A. Numerical Values, Range of Values and Descriptive Rating on the Benefit of Agroforestry Farming Practices adopted by the Respondents.

Numerical Values	Range Values	Descriptive Rating
5	4.20 – 5.00	Very Highly Adopted
4	3.40 – 4.19	Highly Adopted
3	2.60 – 3.39	Moderately Adopted
2	1.80 – 2.59	Fairly Adopted
1	1.00 – 1.79	Not Serious

B. Numerical Values, Range of Values and Descriptive Rating on the Degree ofSeriousness of the Problems Encountered by the Respondents.

Numerical Values	Range Values	Descriptive Rating
5	4.20 – 5.00	Very Highly Serious
4	3.40 – 4.19	Highly Serious
3	2.60 – 3.39	Moderately Serious
2	1.80 – 2.59	Fairly Serious
1	1.00 – 1.79	Not Serious

IV. RESULTS AND DISCUSSIONS

This section presents the findings, interpretation, analyses of data gathered from the respondents of the study. It includes the socio-demographic profile of such as gender, age, civil status, ethnicity, land tenure, number of years in agroforestry farming, income from agroforestry farming. It also includes farm profile such as farm size, farming practices, components of agroforestry system, problems encountered and correlation analysis between income derived from agroforestry farming to educational attainment and number of years in farming.

Table 1. Frequency Distribution of Respondents by Socio- demographic Profile

Profile	**Frequency (f)**	**Percentage (%)**
1. Gender		
Male	77	75.49
Female	25	24.51
Total	**102**	**100.00**
2. Age		
41-50	37	36.27
31-40	29	28.43
51-60	24	23.53
21-30	6	5.88
61 years & Above	6	5.88
Total	**102**	**100.00**
3. Civil Status		
Married	98	96.08
Widower	4	3.92
Total	**102**	**100.00**
Profile	**Frequency (f)**	**Percentage (%)**
4. Educational Attainment		
Elementary Level	44	43.14
High School Level	32	31.37

Continuation of Table 4

Profile	**Frequency (f)**	**Percentage (%)**
College level	11	10.78
High school graduate	6	5.88
Elementary graduate	5	4.90
College graduate	4	3.92
Total	**102**	**100.00**
5. Etnicity		
Kalinga	89	87.25
Ilokano	9	8.82
Igorot	2	1.96
Itawes	2	1.96

Total	**102**	**100.00**
6.Tenure of Land		
Owner operator	102	100.00
Total	**102**	**100.00**
7. Number of Years in Agroforestry Farming		
6-8 years		
5 years & below	50	49.02
9 years & above	46	45.10
Total	6	5.88
8. Farm Size Devoted to AF Farming	**102**	**100.00**
1-5 ha.		
	64	62.75
	33	32.35
Below 1 ha.	5	4.90
11 ha. And above	**102**	**100.00**
Total		
Farm Size Devoted to AF Farming		
1-5 ha.	64	62.75
Below 1 ha.	33	32.35
11 ha. And above	5	4.90
Total	**102**	**100.00**
9. Monthly Income		
3,000 & below	85	83.33
3,001-5,000	10	9.80
9,001 & above	4	3.92
5,001-7,000	2	1.96
7,001-9,000	1	0.98
Total	**102**	**100.00**

Continuation of Table 4

Profile	**Frequency (f)**	**Percentage (%)**
10. Farming Income before AF Farming		
3,001- 5,000		
9,001 & above	30	29.41
5,001-7,000	29	28.43
3,001 & below	23	22.55
7,001- 9,000	18	17.65

Total	2	1.96
	102	**100.00**
11. Farming Income During AF Farming		
9,001 & above	38	37.25
3,001-5,000	26	25.49
5,001-7,000	21	20.59
3,000 & below	12	11.76
7,001- 9,000	5	4.90
Total	**102**	**100.00**
12. Other Sources of Income	90	88.24
Laborer	4	3.92
Store owner	3	2.94
Gov't worker/official	3	2.94
None	2	1.96
Carpentry	**102**	**100.00**
Total		
13. Distance of e Households to the Farms		
1-2 km		
Less than 1 km	54	52.94
3-4 km	20	19.61
7 km & above	20	19.61
5-6 km	7	6.86
Total	1	0.98
	102	**100.00**
14.Source of Capital used for AF Farming		
Loan		
Cooperatives		
Friends	75	73.53
Self-financed	2	1.96
Total	25	24.51
	102	**100.00**

The salient findings of the study were the following:

Most of the respondents (75.49%) were males while 24.51% were females. Many of the respondents (36.27%) belonged to the age bracket of 41 to 50 years and almost all (96.08%) were married.

Many (43.14%) of the respondents have elementary education, some (31.37%) have high school education and few have attained college education (10.78 %), 5.88% are high school graduates, 4.90% graduated from elementary, and 3.92% graduated from college.

Almost all (87.25%) of the farmer-respondents are Ikalingas and owner operators of the farms they are tilling. Less than half (49.02%) of the farmers have 6 to 8 years of farming experience. A great majority of the respondents (62.75%) were cultivating 1 to 5 hectares of

land, while 32.35% have size less than one hectare and few (4.9%) have above 10 hectares.

Almost all (88.24%) of the farmer-respondents were laborers and (83.33%) earned a monthly income of Php 3,000.00 and below while some (29.41%) of the respondents earned Php 3,001 to Php 5,000 before engaging in agroforestry farming. Many (37.25%) earned Php 9,001 and above, and some (25.49%) earned Php 3,001 to Php 5,000 during the adoption of agroforestry practices.

On the distance of their households their farms, majority (52.94%) reside within 1 to 2 kilometers while few (0.98%) reside within 5 to 6 kilometer distance.

A great majority (72.55%) of the farmers were members of cooperative while some (27.45%) were members of the Federation of Farmers. A great majority (73.53%) of the respondents borrow their capital from cooperative; few (24.51%) were self- financed and only 2 borrow from their friends.

Almost all (96.08%) of the respondents practiced multi-storey farming planted with trees composed of yemane, mahogany, mango, citrus, rambutan, lanzones and coffee. The integrated crops are pigeon pea, banana, corn and eggplant.

In terms of economic benefits that are derived from agroforestry farming practices, it is observed that the farmer-respondents are moderately benefited with a mean of 3.04. The respondents rated source of food as the highest followed by the source of lumber and construction materials, sources of fuel wood, income, green manure/soil fertility, feed/fodder for the animals, and source of herbal medicine which was rated the lowest.

On the environmental benefits of agroforestry farming practices, the respondents claimed to be moderately benefited with a mean of 3.35.

Soil erosion control as a function/benefit of agroforestry was claimed the highest with a rating of 3.60 because of its protective function in minimizing the occurrence of soil erosion brought about by strong typhoons and heavy rains during wet season; followed by flood and drought control, carbon sequestration, improvement of water quality, climate amelioration, soil formation and fertility improvement, biodiversity conservation, increase water quantity, and control of pest and disease. Meanwhile, the increase in crop production was rated the lowest due to the large population of trees present in their multi-storey farms that limited the space allotted for crop production.

The farmer-respondents were fairly benefited in terms of cultural benefits with a mean of 2.33. Landscape improvement was rated the highest because of the presence of diverse species of trees and crops planted in their farms that obviously improved the physical aesthetic feature of their farms.

Results showed that the degree of seriousness of the overall problems/constraints encountered by the farmer-respondents was fairly serious with a mean of 2.26. However, poor location was rated as the highest, followed by forest fire, erratic weather conditions, lack of infrastructure, slow delivery of support services, lack of farming skills and distance of farm to household which were all considered moderately serious, while the rest were claimed fairly serious except the non-ownership of land and unstable tenure status which is not serious and rated as the lowest because the farmers were themselves owner operators of their farms.

From the findings of Solomon (2019) and Ninh (2021), higher education contributes to productivity/output. This claim conforms to the reports of researchers to include educational attainment as an explicit determinant of agricultural output (e.g. Vollrath, 2007; Asadullah and Rahman, 2009; Reimers and Klasen, 2013; Wouterse, 2016; Wouterse, F. and Badiane, 2019). Moreover, Onwubuya (2005) stated that highest agricultural productivity depends primarily on the education of the rural farmers to understand and accept the complex scientific changes that are difficult for the uneducated rural farmer.

Ethnicity

Almost all (89 or 87.25%) of the respondents are IKalingas, few (8.82%) are Ilokano and 1.96% each for Igorot and Itawes. This implies that upland agroforestry farmers in Rizal, Kalinga are dominated by Ykalingas.

In the article on the importance of ethnicity in the depletion of the forest resources in the Sierra Madre (northeast Luzon, Philippines), it argues that ethnically highly diverse population living on the forest edge shows little variation in the exploitation of available resources. ethnic groups seem to be engaged in the same kind of activities irrespective of their cultural background. However, once resources become scarcer and the population is offered opportunities for community forestry, ethnicity becomes a highly relevant factor for the future management of diminishing resources (Schlesing & Munishi, 2020)

Land Tenure Status

All (102 or 100%) of the respondents are owner operators of the land they are cultivating. This implies that land tenure is not a problem in the upland barangays of Rizal, Kalinga.

Land tenure is the relationship, whether legally or customarily defined among people as individuals or groups with respect to land. It is an institution, i.e., rules invented by societies to regulate behaviours. Rules of tenure define how property rights to land are to be allocated within societies. They define how access is granted to rights to use, control, and transfer land, as well as associated responsibilities and restrains. In simple terms, land tenure systems determine who can use what resources for how long, and under what conditions. Land tenure is an important part of social, political and economic structures. It is multi-dimensional, brining into play social, technical, economic, institutional, legal and political aspects that are often ignored but must be taken into account (FAO, 2015).

Land tenure distribution has been a salient issue in the Philippines for decades. In recent years, population growth and degradation of productive land has led to increased stress and tensions between smallholder farmers, wealthy landlords and the state. Philippines, as agriculture is an essential livelihood, and difficult access to land tenure is correlated with poverty, which is a mainly rural phenomenon (ADB 2009; Boras; Tadem , 2015). Farmers protest to obtain rights to land has often been met with violence from landlords and security forces.

In connection to land tenure issues contributing to deforestation, degradation of the environment, lowering of carrying capacities of soils, poaching and extinction of wild biotic resources, the Comprehensive Agrarian Reform Program was implemented in 1988 to promote a more equitable distribution of land and improve productivity. Although the reform contained more favourable provisions for farmers, its success is still being debated after its completion in 2014 (Asia: Land and Foods, n.d).

Idoma and Ismail (2014) have also suggested that inalienability, insecurity of tenure system, land fragmentation and atomization of holdings due to customary law of inheritance have been responsible for the growing small scale and subsistence farming systems which no longer meet the food and industrial demand of the present growing population. Further, the lack of secure access to land is closely linked to poverty, especially in rural Philippines.

Number of Years in Agroforestry Farming

Almost half (49.02%) and 45.10% of the respondents were engaged in agroforestry farming from six to eight years and five years below, respectively, only few (5.88%) were engaged for more than nine years. This implies that most of the upland agroforestry farmers adopt agroforestry farming during the implementation of the Integrated Natural Resources and Environmental Management Project (INREMP) which was mentioned during the interview. This is a seven year project of the Asian Development Bank (ADB) being implemented by the Department of Environmental and Natural Resources. (DENR).

Farm Size Devoted to Agroforestry Farming

In terms of farm size, most (62.75%) were tilling 1 to 5 hectares. Many (32.35%) of them were tilling less than one hectare and the rest (5 0r 4.9%) were tilling above 10 hectares. The average farm size devoted to agroforestry by the farmer-respondents is 2 hectares which is higher than the farm size devoted in agroforestry in Ifugao which is less than a hectare (Latap, 2015). This means that farmers had enough area allocated for agroforestry farming.

In the statement of Noack and Larsen (2019), increasing farm size reduces the output per unit of land but larger farms have higher output per unit of labor. Further income fluctuations decline with increasing farm size while the risk of aggregate production increases with increasing farm size and the effects can be large. In addition, they that indicated that while output per unit of land does decline with increasing farm size as suggested by previous literature, agricultural incomes increase with farm size, the variance of local food production increases with farm size. This suggest that farmers benefit from larger farms, earning higher and more stable incomes while consumer suffer from lower and more volatile food supply.

While there is an inverse relationship between land productivity and farm size, there is a direct relationship between labor productivity and size. Analysis of the farm size and productivity relationship using labor productivity suggests that larger farms are more productive than their smaller counterparts (Helfand and Taylors , n.d.).

Monthly Income from Other Sources

Almost all (83.33%) of the respondents earned a monthly income of Php 3,000 and below, few (9.80%) earned Php 3001to Php 5000, 3.92% earned Php 9,000 and above, 0.98% to 1.96% earned Php 5,001 to Php 7,000 and Php 7,001 to Php 9,000 respectively. Results indicate that their low income could hardly sustain the basic needs of their family. However, respondents have other sources of income (as labourers) to sustain their living.

Monthly Income before Adopting Agroforestry Farming

In terms of farming income before adopting agroforestry, many (29.41%) of the respondents earned Php 3,001 to Php 5,000, 28.83% earned Php 9,001 and above, 22.55% earned Php 5,001 to Php 7,000, 18 or

17.65% earned Php 3,000 and below, and the rest (1.96%) earned Php 7,001 to Php 9,000.

Monthly Income after Adopting Agroforestry Farming

Many (37.25%) of the respondents earned Php 9,001 and above, 25.49% earned Php 3,001 to Php 5,000, 20.59% earned Php 5,001 to Php 7,000, 11.76% earned Php 3,000 and below, and the rest (4.90%) earned Php 7,001 to Php 9,000. These results show that their income increased when the farmers adopted agroforestry farming. Studies showed that agroforestry practices were able to generate more income and increased the standard of living through integrated farming system (Muza et al., 2019; Dahlan & Kamal, 2014).

In conformity to this report, Gangadharappa et al. (2003), stated that farmerswere found earning at an average of $800 or Rs. 31466.20 every year from one acre of agroforestry plot which is much profitable than any traditional crop. The farmers were also able to save surplus money in the bank, which is a healthy sign of economic sustainability. He further reported that agroforestry is found to be the most desirable strategy for maintaining social, economic and ecological sustainability in India. This findings prompted them to conduct a study in India to investigate the following: the perception and attitude of farmers towards agroforestry; the crop diversity maintained in agroforestry; the adoption level of agroforestry practices; and the ecological impact of agroforestry on the farmers. As a result of their investigation, findings was found to be significant on social, economic and ecological conditions of the farmers. Among the social parameters celebration of festivals, migration and communication exposure were found to contribute more to the total impact of agroforestry on farmers. While among the economic parameters, family income, livestock possession and employment status were found to contribute more to the total impact of agroforestry on farmers. They concluded that agroforestry has brought improvement in socio-economic and ecological conditions of farmers by generating employment, increasing family income, enhancing the drop diversity and reducing dependency on natural forest. Therefore, development agencies can use the success story of agroforestry to stimulate other farmers to attain both natural resources and socio-economic sustainability.

Relative to the above findings on agroforestry practices (Desmewati et al., 2021) of Parungpanjang FASP, reported that although it contributed to the income of group members, however, the effects were found still imbalanced which were influenced by the types of plant cultivated, motivation and skills, and age relative ability to manage land. Based on the results of their regression analysis, age and land area were the two agroforestry factors that influence farmer's income. They suggested therefore, that in order to sustain the contribution of agroforestry system to the farmer's income in the Parungpanjang FASP, it is necessary to increase land productivity by assessing profitable intercropped plant types in corresponding soil or land characteristics and minimum requirements of physical treatments. Furthermore, FTSTRDC need to strengthen the capacity of farmer's group members by facilitating technical capacity for training of good agricultural practices, including facilitating the business model and market network of agroforestry products.

Distance of Households to Farms

Majority of the respondents (52.94%) lived within 1 to 2 kilometers from their farm, 19.61% each lived in less than a kilometre and 3 to 4 kilometres, 6.86% lived in 7 kilometers and above, and 0.98% lived in 5 to 6 kilometers away from the farm they till. Living within reach to the farm affords a farmer closer supervision as well as immediate attention and action on any need that may suddenly occur. Time, effort and money that are otherwise wasted unnecessarily due to distance are spared for more profitable pursuits.

Membership to Organization

Most (72.55%) of the respondents are members of cooperative and the rest (27.45%) are members of Federation of Farmers. The result indicates that the farmer-respondents have a positive concept on the role and benefit provided by joining organizations hence, their willingness to participative or to register as members of the organization within their community.

In agreement to the importance of farmer' organization, (Penunia, 2021) claimed that farmers' organizations (FOs) are essential institutions for the empowerment, poverty alleviation and advancement of farmers and the rural poor. Politically, FOs strengthens the political power of farmers, by increasing the likelihood that their needs and opinions are heard by policy makers and the public. Economically, FOs can help farmers gain skills, access inputs, form enterprises, process and market their products more effectively to generate their incomes. By organizing, farmers can access information needed to produce add value, market their commodities and develop effective linkages with agencies such as financial service providers, as well as output markets. FOs can achieve economies of scale, thereby lowering costs and facilitating the processing and marketing of agricultural commodities for individual farmers. Marketing-oriented FOs can assist their members purchase inputs, equipment, meet quality standards and mange the drying, storage, grading, cleaning, processing, packaging, branding, collection and

transportation of produce. In this way FOs provide a more reliable supply to buyers and sell larger quantities at higher prices. Organized farmers have greater bargaining power than individuals and are better able to negotiate with other more powerful market players to ultimately increase the profits that accrue to farmers rather than intermediaries and buyers. The role of farmers' organizations is to empower and promote the leadership of rural women.

Moreover, farmers' organization play an important role to help members increase their access to supports of information, capital, and technology; bring benefits to members; and partly promote production, enhance productivity, and increase income (Vu , Ho & Hoi Le , 2011).

Source of Capital used for Agroforestry Farming

Most (73.53%) of the respondents borrow their capital from cooperatives, 24.51% self-finance, and 1.96% borrow from their friends. Result implied that the respondents have insufficient capital to use in their farming activities due to their minimal income (Table 2).

As commonly observed, most small farmers borrow money for the requirement of capital. They borrow money from large farmers or traders that they supply various raw materials for cultivation of land or moneylenders within the village. These moneylenders charge a high rate of interest on the amount borrowed. More specifically, capital can be the money that companies use to buy resources, as well as the physical assets companies use when producing goods or services, such as factories and machinery. Capital is an important factor of production because it allows labor and land to be purchased.

The difficulties faced by small farmers due to lack of capital include the following: the small farmers are not able to do work properly; they don't have enough money to pay taxes; and as we all know that today's time the farmers need more capital than before to increase their crop production. They are not able to do farming properly because of lack of less land.

Without working capital, farms cannot reinvest in their crops. Farmers are then not able to pay out their employees, nor will they invest in new and reliable equipment. Farms are an industry in which having money leads to making money, and not having money makes it impossible to continue generating revenue. A working capital loan makes it possible for a farm to remain open during lean times and eventually recover. Even though having strong working capital is essential to farm business, many of them struggle to maintain this buffer. Even when working capital is achieved, it can be wiped out by issue s as they arise (My company, n.d.).

Agroforestry Farming Practices Adopted

The agroforestry farming practices adopted by respondents is presented in Table 5. Almost all (96.08%) of the respondents adopted multistorey system, 1.96% adopted intercropping and the rest adopted silvopasture and windbreak.

Table 2. Agroforestry Farming Practices Adopted by the Respondents

Agroforestry Practices	Frequency (f)	Percent (%)	Rank
Multistorey	98	96.08	1
Intercropping	2	1.96	2
Silvopasture	1	0.98	3
Windbreak	1	0.98	3
Total	**102**	**100.00**	

The results imply that the farmers were knowledgeable in multistorey agroforestry practices because of the multifarious benefits derived from it. They also observed that the more species they plant, the more harvest/products they could derive resulting to more income. This holds true to the findings of Sharma et al. (2020), that multi-storied cropping is found to be sustainable productivity by which natural resources are utilized efficiently to enhance productivity of the main crop (15-20%) and high revenue realization per unit area (50-90%).

Components of Agroforestry Farming Practices

Table 2a shows that Narra (Pterocarpus indicus), yemane, acacia, mango, citrus and rambutan were the major trees used, while pigeon pea and banana were the major agrticultural crops integrated in their multi-storey farm. Farmers did not integrate livestock because of the fear that their animals will only graze and destroy their

trees and crops which they have mentioned during the interview.

Table 2a. Components of Agroforestry Farming Practices Adopted by Respondents

Components of Agroforestry Practices	Frequency N=102	Percent (%)
Forest Trees		
Yemane	102	100.00
Mahogany	48	47.06
Fruit Trees		
Mango	99	97.06
Citrus	97	95.10
Rambutan	85	83.33
Lanzones	56	54.90
Coffee	5	4.90
Crops		
Corn	27	26.47
Pigeon pea	92	90.20
Eggplant	2	1.96
Banana	92	90.20
Livestock		
Cattle	3	2.94
Carabao	1	0.98

According to Fern (2022), yemane tree has suitable characteristics for agroforestry, with fast growth, ease of establishment, and relative freedom from pest outside its natural range. It is an especially promising fuelwood species and can be intercropped with crops like maize and cassava which has been found beneficial in increasing the simultaneous production of wood and food. It is also used as windbreak and as a hedge.

Benefits of Agroforestry Farming Practices Adopted by the Farmers

Table 3 shows the economic, environmental and cultural benefits of agroforestry farming practices adopted by the farmers. On the general benefits derived from agroforestry farming, the environmental aspect was rated the highest with a mean of 3.35 (highly benefit)) followed by economic benefit with a mean of 3.04. The cultural aspect was the least rated with a mean of 2.33 (fairly benefited).

The environment benefit was observed and was claimed to be favored by the upland farmer-respondents because somehow, it was able to address their problem on soil erosion which is experienced particularly during rainy season and the occurrence of typhoons. These benefits observed reflect the protective function of agroforestry.

Considering the other aspects under the environmental benefits, soil erosion, flood and drought control, carbon sequestration and improvement of water quality were rated highly benefited with means of 3.60, 3.51, 3.50, and 3.43 respectively. This is the reason why they have adopted the multi-system because the forest trees and fruit trees they have planted had addressed their problems on soil erosion, drought and flood which were attributed to the multi-functions of trees in their upland farms. This result also conforms to the claim of Sharma et al. (2020), that multi-storey cropping reduces the impact of hazards like soil erosion, flood and landslide. Additionally, she reported that it can also sequester carbon over pure stands; that the presence of cover crops will also enhance the soil carbon content, thus participating in climate change mitigation; and likewise improves soil health and soil fertility, reduce weed, pest and disease, enrich biodiversity, and maintain ecological balance.

Table 3. Benefits of Agroforestry Farming Practices Adopted by the Respondents

Benefits of Agroforestry Practices	Mean	Descriptive Equivalent
A. Economic Benefits		
1. Source of food	3.43	Highly Benefited
2. Source of feed/fodder for animal	2.68	Moderately Benefited
3. Source of herbal medicine	2.56	Fairly Benefited
4. Source of lumber and construction materials	3.37	Moderately Benefited
5. Source of fuel wood		
6. Source of income	3.37	Moderately Benefited
7. Source of green manure/	2.97	Moderately Benefited
Soil fertility	2.84	Moderately Benefited
Mean		
B. Environmental Benefits	**3.04**	**Moderately Benefited**
1. Climate amelioration		
2. Improvement of water quality	3.37	Moderately Benefited
3. Pest and disease control	3.43	Highly Benefited
4. Flood and drought control	3.25	Moderately Benefited
5. Increase water quantity	3.51	Highly Benefited
6. Increase crop production	3.32	Moderately Benefited
7. Soil erosion control	2.91	Moderately Benefited
8. Soil formation and fertility	3.60	Highly Benefited
Improvement	3.37	Moderately Benefited
9. Carbon sequestration		
10.Biodiversity conservation	3.50	Highly Benefited
Mean	3.33	Moderately Benefited
C. Cultural Benefits	**3.35**	**Moderately Benefited**
1. Landscape improvement		
2. Historical consideration	3.07	Moderately Benefited
3. Spiritual consideration	1.87	Fairly Benefited
4. Aesthetic considerations	1.86	Fairly Benefited
Mean	2.51	Fairly Benefited
	2.33	**Fairly Benefited**

Legend:

4.20 – 5.00 Very Highly Benefited

3.40 – 4.19 Highly Benefited

2.60 – 3.39 Moderately Benefited

1.80 – 2.59 Fairly Benefited

1.00 – 1.79 Not Benefited

Furthermore, increased crop production was rated the lowest due to the large population of trees present in their multi-storey practice that limited the space for the production of agricultural crops. On the economic benefits, source of food was rated the highest with a mean of 3.43 (highly benefited) followed by the source of lumber and construction materials, source of fuel wood, source of income, source of green manure/soil fertility, source of feed/fodder for the animal which ware rated were moderately benefited, The source of herbal medicine was the least with a mean of 2.56 (fairly benefited).

In terms of the cultural benefits, landscape improvement was rated moderately benefited and the rest such as historical, spiritual consideration and aesthetic values were rated fairly rated benefited. Nevertheless, the presence of the diverse species of trees and crops had contributed to the beauty and improved the total landscape of their agroforestry farms.

The results of the study on the benefits derived when adopting agroforestry practices agrees to the claim of (Zada et al., 2022), that agroforestry provides several benefits to the household like income, food, firewood and construction and improving not only the cultural, environmental but primarily the socio-economic needs of farmers (Gangahharappa et al.,2003).

Problems Encountered by the Respondents

Table 4 presents the problems as well as the degree of seriousness encountered by the respondents in their agroforestry farming practices.

On the farmers' problem such as low productivity, occurrence of pest/diseases, high cost of production, and seed quality were all rated fairly serious, while on the resource problems of farmers such

as small farm size , inadequate water availability, poor land quality (e.g. soil class, soil texture & soil type) , were all rated fairly serious, while on poor location (e.g. access to market and other services), it was moderately serious, and the non-ownership of land and unstable status (tenant) was rated not serious.

On Inadequate capital, poor access to credit and lack of financial assistance were rated fairly serious. On the institutional aspect, the lack of infrastructure and slow delivery of support services were both rated moderately serious.

In terms of other problems encountered by farmers such as distance of farm to the household, lack of skills in farming, erratic weather conditions, forest fire were rated moderately serious, while the technology of farming practices was claimed not sound which was rated fairly serious.

Additionally, on the overall problems experienced by farmers, results show that the problem on resources such as small farm size, non-ownership of land and unstable status (tenant), inadequate water availability, poor land quality (e.g. soil class, soil texture & soil type), and poor location (e.g. access to market and other services) were identified as highly serious problems that affected their adoption of agroforestry practices with a rated mean of 3.99. Despite that all of the farmer-respondents are owners of the land they are cultivating and have devoted 1-5 ha of land for agroforestry farming, they still face a problem in bringing or transporting their products to the market because of the long distance from the source of products to the market, particularly so when perishable products are transported.

The slow delivery of support services such as technical assistance, loans, farm inputs such as seeds, fertilizers and other planting materials were also identified as problems that brought about low productivity.

On the overall results as classified, it was observed that the problem on resources was the highest with a descriptive rating of highly serious followed by institutional linkages (moderately serious), while the inadequacy of labor, farmer's problem, and inadequate capital were rated fairly serious.

Table 4. Problems Encountered in the Adoption of Agroforestry Farming Practices Based on Classification .

Classification	Mean	Descriptive Equivalent
A. Farmers Problem		
1. Low productivity	2.32	Fairly Serious
2. Occurrence of Pest/diseases	2.02	Fairly serious
3. High cost of production	2.33	Fairly Serious
4. Seed quality	1.96	Fairly Serious
Mean	**2.16**	**Fairly Serious**

Continuation of Table 4

C. Inadequate Labor 4		
1. Low productivity of labor	2.27	Fairly Serious
2. Underutilization of farm labor	2.23	Fairly Serious
3. Limited opportunity of farm labor	2.26	Fairly Serious
4. Limited supply of family labor	2.34	Fairly Serious
Mean	**2.28**	**Fairly Serous**
D. Inadequate Capital		
1. Poor access to credit	1.88	Fairly Serious
2. Lack of financial assistance	1.98	Fairly Serious
Mean	**1.93**	**Fairly Serious**
E. Institutional Linkages		
1. Lack of infrastructure	2.69	Moderately Serious
2. Slow delivery of support services	2.67	Moderately Serious
Mean	**2.68**	**Moderately Serious**
F. Other Problems		
1. Distance of farm to the household	2.43	Moderately Serious
2. Technology of farming practices not sound	2.17	Fairly Serious
3. Lack of skills in Farming	2.60	Moderately Serious
4. Erratic weather condition	2.73	Moderately Serious
5. Forest fire	2.78	Moderately Serious
Mean		
Grand Mean	**2.54**	**Fairly Serious**
	2.59	**Fairly Serious**

Legend:

4.20 – 5.00 Very Highly Serious

3.40 – 4.19 Highly Serious

2.60 – 3.39 Moderately Serious

1.80 – 2.59 Fairly Serious

1.00 – 1.79 Not Serious

Correlation Analysis

Table 5 shows the correlation analysis of income in agroforestry practices, educational attainment and years in agroforestry farming.

Table 5. Correlation Analysis of Income in Agroforestry Practices, Educational Attainment and Years in Agroforestry Farming.

		Income in Agroforestry farming
Income in agroforestry farming	Pearson's Correlation	1

	Sig. (2-tailed)	
	N	102
Educational attainment	Pearson's Correlation	0.058
	Sig. (2-tailed)	0.559
	N	102
Years in agroforestry farming	Pearson's Correlation	-0.065
	Sig. (2-tailed)	0.515
	N	102

Legend:

N – Number of respondents

Results show that there is no significant relationship of income in agroforestry to educational attainment and years in farming. Income in agroforestry farming and educational attainment is markedly low and negligible positive correlation, while income in agroforestry farming and number of years in farming is markedly low and negligible negative correlation. The results of this study contradicted the result of the study conducted by Iduma et al. (2020), that farmers with higher number of years of farming experience are likely to produce higher yield than those with fewer years of experience and those with better education have better chance of increasing their farm output especially when they bring the acquired knowledge they have acquired in their years of education to bare in their farming activities.

V. CONCLUSIONS

Based on the results of the study the following conclusions were drawn:

1. A great majority of the respondents were males and almost were married. Many belonged to the age group of 41 to 50 years old. In terms of educational attainment, many of the farmer-respondents have obtained elementary education and almost were Ikalingas. All the respondents were owner operators, and engaged in agroforestry farming for 6-8 years. A great majority have 1 to 5 hectares devoted for agroforestry farming. Almost all of the respondents were not only owner operators but act as laborers in their agroforestry farms earning a monthly income of Php 3,000 and below (before adopting agroforestry practices). Some of them earned Php 3,001 to Php 5,000 and Php 9,001 and above. Many of the farmers earned Php 9,001 and above during the adoption of agroforestry practices. Majority of the respondents have 1 to 2 kilometer - distance from their households to their farms. To sustain their agroforestry farming activity, most of them borrow their capital farming from cooperative present within their community.

2. Almost all of the farmers are engaged in multistorey farming with tree components of yemane, mahogany, mango, citrus, rambutan, lanzones and coffee. The agricultural crops that are integrated are pigeon pea, banana, corn and eggplant were the integrated/under shade crops used by the farmers.

3. In terms of benefits of agroforestry farming practices, the farmers claimed to be moderately benefited on economic and environmental benefits and they are fairly benefitted on cultural aspects.

4. The degree of seriousness of the overall problems/constraints encountered by the farmer-respondents is fairly serious.

5. Income derived from the adoption of agroforestry farming practices and educational attainment is markedly low and negligible positive correlation, while income from agroforestry farming practices and number of years engaged in agroforestry farming is markedly low and negligible negative correlation.

VI. RECOMMENDATIONS

Based on the above findings, the following recommendations are presented:

1. Agroforestry farmers should be technically and financially assisted to improve and arrive to a sustainable production and income.

2. Initiative should be considered among the community people and the government or non-government organizations via financial and technical assistance to equip or empower the farmers by conducting hands-on-training, seminars and capability building to pursue a more sustainable agroforestry production and improve the socio-

economic condition of the farmers in the upland barangays of Rizal, Kalinga.

3. Provision of post-harvest facilities and trainings in consideration to the lack of accessibility to farm and to market roads so as to preserve their perishable goods and not just go wasted.

4. Monitoring and fast delivery of support services such as planting materials and farm inputs such as fertilizers and pesticides be provided to address their problems on the occurrence of pests and diseases for a higher production.

5. And since there was an observed increase of income of upland farmers when they have engaged in agroforestry farming as compared to their income when they have not yet adopted agroforestry farming, would motivate or serve as a welcome opportunity and initiative in forging partnership between Local Government Units and the upland farmers of Kalinga in the provision of farm to market road to ease the burden of transporting their agroforestry products to the market particularly the perishable ones. It should be noted that agroforestry farming has become their source of livelihood and survival; hence, this should be one of the focus and concerns of the LGs as part of their plan of programs/projects.

6. Similar study must be conducted to determine the income generated from the tree species planted in their integrated multi-storey farms.

7. Formulate an intervention plan to appropriately address the problems encountered by the farmer-respondents in the pursuit of sustainable agroforestry farming in the upland barangays of Rizal, Kalinga.

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