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Agroforestry System on the Coffee Based Project of Psau

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Abstract

The intercropping of cash crops that allows us to produce seeds for the subsequent project, the availability of fruits for sale, which has aided the farmers' financial situation, and the project's highest rate of cash crop income, with the exception of tomatoes and bitter melon, which did not succeed due to environmental conditions and crop harvest characteristics, have all contributed to the success of the Agroforestry System implementation to PSAU coffee-based project findings.

The importance of the agroforestry system is obvious, particularly for farmers, because no land is wasted but rather put to various and useful uses, and farmers are given actual guidance to fully understand how to use the land to its maximum potential.

A total of 5,120 square meters of coffee plantation were used, with cash crops such as chili pepper, eggplant, lady finger, bitter-melon, and tomato intercropped. An average of 209.56 kl of Chili Pepper sold for 31, 736 pesos, 2,336 kl of Ladyfinger sold for 149,339 pesos, and 668.31 kl of Eggplant sold for 42,224 pesos in a 1-hectare prediction. Tomato and bitter-melon did not survive and were not sold due to environmental conditions and crop harvest features.

Chili pepper intercropped to coffee plantation raised income by 31.94%, Lady finger increased income by 150.28%, and eggplant enhanced income by 42.51% in a 1-acre prediction. According to research, agroforestry intercropping systems greatly boost farmer revenue.

Keywords: Intercropping; Agroforestry; Farmers; Coffee Plantation and Income

Introduction

The COVID-2019 pandemic affects Agriculture in the supply and demand for food [1]. As the pandemic progresses, limits in the movements causing difficulties for farmers to bring their products in the market and shortage of labor led to low production which put strains on farm income (OECD Policy Responses to Coronavirus (COVID-19). The impacts of the pandemic on agriculture introduced two issues, one is to guarantee production and supply of agricultural products, and alleviation of farmers' income [2].

Agroforestry is a land use systems and technology where woody perennial such as shrubs, palms bamboo etc. and agricultural crop are deliberately combined in the same piece of land. By promoting tree planting agroforestry it can be an economically and environmentally sustainable option for small-scale farmers as Agroforestry involves more than two components (tree and non-tree) agroforestry produces two or more outputs [3]. For hungry and food-insecure communities, agroforestry creates more resilient agricultural systems where the risk of crop failure is minimized and spread between diverse crops.

Agroforestry has this inherent ability to provide a balance of staggered food production, generate income and the protection of environment. It is considered to be the system of choice to community farming [4].

This field aims to equipped farmers with skills and knowledge in Agroforestry by maximizing their land through intercropping to produce more products which will contribute to increased farmer's income amidst this global pandemic.

Objectives

to optimize the used of the Coffee based project land to its maximum potential; to determine the yield of different cash crops intercropped with coffee plantation; and to determine the income, increase of the different coffee farmers through the intercropping technology.

Materials and Methods

Reconnaissance Survey at the Study Site

To obtain substantial information about the study site, a reconnaissance survey was conducted on the study site, photo documentation was done to identify the site preparation activities, and some members of the farmers will be interviewed regarding the site productivity, characteristics and current status.

Community Meeting and Identification of Farmer Co-Operators

An Information, Education and Communication (IEC) meeting was conducted to educate the farmers with the introduction of agroforestry intercropping technology, its importance, processes and benefits. In this meeting, they were also asked if they are willing to adopt the said technology to determine the number of farmers that was involved in the technology.

Farm and Farmer Evaluation

Model farmers who are willing to adopt the technology was evaluated if their site and availability of water resources. Farmers were also interviewed gathering information on their income on their coffee plantation before and after the technology was introduced.

Procurement and Distribution of Planting Materials

Farmers were met for immediate distribution of the seeds and other planting materials. Farmers were also instructed from the site preparation to harvesting. Each farmer were given the material for planting such as; Lady-finger seeds, Eggplant seeds, hot pepper seeds, Bitter melon seeds, tomato seeds, fertilizers, and seed trays.

Site Preparation

On their site preparation, the Coffee-based plantation ground was weed cleared. All Coffee rows were established with heels depending on the prescribed heel spacing of the crop based on the Bureau of Plant Industry planting guides.

Seed/Seedling Sowing

Seeds were sown in seed trays and were transplanted directly on the experimental area/farms in accordance to Bureau of Plant Industry Planting Guides of each commodity.

Care and Maintenance

Fertilizer treatments was applied before and after planting the different crops. Plants were maintained free from pests and weeds. Manually weeds were removed as needed arises. Imposition of watering was held thrice a week.

Evaluation of Performance and Yield of each Farmer

Evaluation on the practices, performance of each farmer was collected. Yield and performance of each commodity per farmer were also collected to determine market value and income

Results

Capacity Building

During the first stage of the research, a capacity building was conducted. The Capacity building was attended by all members of the Ayala-San Agustin Farmers Association. during the capacity building, the research was discussed to the farmers including the purpose & objectives, scope and limitations, and research methodology. Planting guide manual were provided to the farmers as guide for preparing the site, planting, maintenance, harvesting and selling of the different cash crops that will be planted on their coffee plantation.

Selection and Distribution of Agricultural Crops and Materials

After the capacity building, farmers were asked if they wanted to join the research program, eight (8) farmers signify their interest on being part of the research. Three (3) were selected based on the capacity, knowledge, availability of coffee plantation, and willingness.

The three selected farmers were provided with different cash crop seeds such as: Tomato, pepper, eggplant, bitter gourd and lady finger. The farmers were also provided with agricultural tools and materials such as seed trays, weighing scale, trellis twine, mulching plastic, urea and complete fertilizers. During the distribution of agricultural crop seeds and materials, the farmers were re informed on the planting guides and the needs of the research study.

Optimization of Coffee based Project Land to its Maximum Potential

The study was able to utilized a total of 5,210 square meters coffee plantation intercropped with different agricultural crops. The selected model-famers were able to utilize available spaces in between coffee plants through planting agricultural crops with proper maintenance on both the coffee and crops. Before planting, Model-farmers prepared the site by pruning the coffee plants to 1.3 meters tall to give way for the agricultural crops' sunlight penetration.

Weeding, mulching hilling, and trellis establishments were involved. Model-farmers used their preferred mode of planting based on the crops. Direct seed planting was conducted by the 2 farmers and the other farmer used seedling tray and transplanting.

Yield of different cash crops intercropped with coffee plantation. In terms of yield in 1 hectare prediction, an average of 209.56 kl of Chili pepper intercropped with coffee was harvested. An average of 2,336.67 kl, 192.33 kl and 688.31 kl for Lady finger, Bitter melon and Eggplant respectively. The super typhoon caused the tomato to die early, resulting in no fruit being collected (Tables 1-3).

Farmer	Tomato	Chili Pepper	Lady finger	Bitter melon	Eggplant
Farmer 1	0	157.85	2600	105	592.31
Farmer 2	0	158.33	2400	152	439.29
Farmer 3	0	312.5	2010	320	1033.33
Average	0	209.56	2,336.67	192.33	688.31

*1 hectare harvest prediction.
Table 1: Total harvested cash crops in kilogram (kg).

Income-increase of Coffee Farmers through the Agroforestry Intercropping Technology

In terms of crop income in 1 hectare prediction, an average of Php 31,736 crop sale for Chili pepper intercropped with coffee. An average of Php 149,339 and Php 42,244 for Lady finger, and Eggplant respectively.

Due to the bitter melon's size, the farmers decided to consume and distributed personally instead. Results of this study pertains only to one cropping/harvesting season. Assuming with a minimum of 2 cropping season will be made on this different cash crops, current data will be doubled.

Farmer	Tomato	Chili Pepper	Lady finger	Bitter melon	Eggplant
Farmer 1	0	24,584	1,59,805	0	25,615
Farmer 2	0	23,750	1,47,512	0	28,785
Farmer 3	0	46,875	1,40,700	0	72,333
Average	0	31,736	1,49,339	0	42,244

*1 hectare harvest prediction.
Table 2: Total sales of Cash crops in Peso.

Shown in Table 3 is the increased in income percentage of the farmers if agroforestry systems will be conducted in their Coffee Plantation. It has been reported from the study conducted by Sanchez, et al. [5] that the coffee farmers average annual income is Php. 198,750.00.

In 1 hectare prediction, Chili pepper intercropped to coffee plantation increased 31.94% income, 150.28% from Lady finger and 42.51% from Eggplant. Study shown that agroforestry intercropping systems significantly produce good income increase for the farmers.

Cash Crop	One cropping season	Two cropping Season	Average Annual income from Coffee (Sanchez, G. et.al, 2020)	Increased Income Percentage
Chili Pepper	Php 31,736	Php 63,472	Php 198,750.00	31.94%
Lady finger	Php 149,339	Php 298,678		150.28%
Eggplant	Php 42,244	Php 84,488		42.51%

*1 hectare harvest prediction.
Table 3: Total Increased income percentage.

Adaptability of Farmers to Agroforestry System

After the implementation of the Project. It has been observed that the Model-Farmers are still continuing Agroforestry systems. The farmers left crop fruits which are later on dried for succeeding planting of cash crops.

The farmers also mentioned that they will continue it in a larger scale agroforestry system. They also mentioned their request for phase 2 implementation with different cash crops

as their request such as: sitaw, ginger and other varieties of Tomato and Bitter melon.

Discussion

Intercropping promotes agricultural biodiversity. By cultivating multiple crops together, farmers can optimize resource use, enhance crop quality and yield, and minimize damage from pests, diseases, and weeds. Farmers with limited resources, income, and crop yield stability often benefit from intercropping. By cultivating multiple crops simultaneously, the risk of total crop failure is mitigated. If one crop underperforms, others may compensate, reducing overall risk. While intercropping can be advantageous, it's important to consider that optimal growing conditions may vary between different crops [6].

Traditional farming practices, such as monocropping, have often prioritized high yields per acre to meet the nutritional demands of increasing populations in certain regions, but these practices However, these systems often rely on intensive inputs like fertilizers, pesticides, and water, which can lead to significant environmental damage and high energy consumption [7].

According to the study of Pakatul, et al. [8] coffee intercropped with shallow-rooted fast-growing vegetables that were fertilized showed improvements in vegetative vigor. This is because land tillage for vegetable intercropping and improved soil porosity led to increased microbial activity and nutrient mineralization. The study involved cabbages (Brassica oleracea), soya beans (Glycine max), and common dwarf beans (Phaseolus vulgaris). While soya beans did well, farmers were not receptive to them. However, cabbages and beans were well-received.

Our study indicates that intercropping vegetables with coffee can be a valuable strategy for households to address land scarcity and boost their financial gains. Coffee pulp, a significant nutrient source, plays a crucial role in both coffee and vegetable cultivation within the coffee farming system. Farmers considering a complete shift to vegetable cultivation should explore the potential of intercropping vegetables with coffee as a means to maximize the income-generating capacity of their land.

Conclusion

The Agroforestry System implementation to PSAU coffee-based project findings has been successful due to the intercropping of cash crops that allows us to produce seeds for the subsequent project, the availability of fruits for sale, which has aided the farmers' financial situation, and the project's highest rate of cash crop income, with the exception of tomatoes and bitter melon which did not succeed due to environmental condition and crop harvest characteristics.

The significance of the agroforestry system is evident, particularly for the farmers, as no land is wasted but rather is put to multiple and beneficial use, and farmers are given genuine assistance to be fully aware of how to use the land in its optimum benefits.

A total of 5, 120 hectares of Coffee plantation were utilized in this intercropped with cash crops such as chili pepper, eggplant, lady finger, bitter-melon and tomato. In a 1-hectare prediction, an average of 209.56 kl of Chili Pepper sold for 31, 736 pesos, 2,336 kl of Ladyfinger sold for 149,339 pesos and 668.31 kl of Eggplant sold for 42,224 pesos. Due to environmental condition and crop harvest characteristics, Tomato and bitter-melon did not survive and is not sold respectively.

In 1 hectare prediction, Chili pepper intercropped to coffee plantation increased 31.94% income, 150.28% from Lady finger and 42.51% from Eggplant. Study shown that agroforestry intercropping systems significantly produce good income increase for the farmers.

Recommendation

Based from the results and activities of the study, it is hereby recommended that the said project be implemented in a larger scale coffee plantation. For some reason, farmers used their personal knowledge of planting cash crops there by it is recommended that strict monitoring on the farmers be conducted.

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