THE CLSU INTERNATIONAL
JOURNAL OF SCIENCE & TECHNOLOGY

Volume 2, No. 2: 38–46 (2017)
www.clsu-ijst.org
ISSN 2507-9368

DOI: 10.22137/ijst.2017.v2n2.05

Sustainability of PALAYAMANAN Project in the Rainfed Lowland and Upland Areas of Bulacan, Philippines

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Submitted July 2017, Accepted October 2017, Published online December 2017

ABSTRACT

Diversified farming system called *Palayamanan* using rice as base crop integrating vegetables, livestock and other farming activities was undertaken by farmer-cooperators in a synergistic approach. With funds coming from DA-RFO III, location-specific rice-based farming system technologies in the rainfed lowland and upland areas of Bulacan were developed, promoted and extended to the farmers. The active participation of farmers, the energetic monitoring of agricultural extension workers from local government units and the collaborative efforts of research and extension institutions of the government were the key ingredients of sustaining the livelihoods of the farmers even during dry seasons. The process consisted of farmers' organization, project orientation with LGUs and farmers, site selection and validation, establishment of model farms, capacity enhancement for farmers that covered field school, skills training, field days, *Lakbay-aral* and cross visits. Participatory technology demonstration, cropping system and variety adaptations appropriate in every location were also done. The capital roll-over of PhP 5,000 helped the fund sourcing for each of 120 farmer-cooperators in the form of loans. The six (6) model farms established were also aided with material inputs. Increased crop yields and crop diversity were achieved as well as profitability and upgraded level of living. Sustainability of the environment, increased knowledge and upgraded skills of the farmers and students involved were the ecological and technical changes attained. The project's strategies were effective that even after the project implementation, the model farms were still maintained by the farmer-cooperators.

Key Words: integrated farming, Palayamanan, rice-based farming

INTRODUCTION

As a new paradigm, *Palayamanan* is defined as a diversified and integrated rice-based farming system with rice being the base crop (Navarro et al., 2015). Rice is the major component of the system as it is the staple food of the Filipino people and major source of livelihood to 70 percent of the Filipino population (Rabbinge and Bindraban, 2012). Rice farming is usually done with the combination of other crops in order to increase the farm productivity and income. This integration of other farming ventures for the development (FAO, 2010) in a synergistic approach is generally implemented by the farm family based on their available resources and existing environment to attain family goals and aspirations (Navarro et al., 2015).

Water productivity in rainfed areas is generally lower than irrigated areas because of efficient resource utilization and food production (Cai and Rosegrant, 2003). The availability of water is one of the major factors of the delay in the production of crops in the rainfed lowlands and upland areas (Navarro et al., 2015). Farmers tend to be idle and could remain deprived as they cannot grow crops due to lack of water supply, which can negatively affect the agro-economic activities of the community. Optimizing available resources to sustain food production and increase productivity through diversified and integrated rice-based farming system is a great challenge in providing better living conditions for the farmers in the rainfed lowlands and upland areas.

In Bulacan, 37 percent of cultivated area for rice is rainfed lowland and uplands. This means that about one-third of the farmers are experiencing limited resources (water and soil), hence inadequate productivity and income due to low efficiency in resource utilization (Rola and Quintana-Alejandro, 1993).

Technology interventions and education or additional trainings on management of inputs play a big role in improving water and land productivity in the rainfed lowlands and uplands (Rola and Quintana-Alejandro, 1993). Therefore, scanning, packaging, integration and demonstration of appropriate technologies for agriculture, forestry and natural resources are some of the strategies to improve the productivity through proper conservation, management and utilization of water and land resources. With this potential in the rainfed lowlands and upland areas through *Palayamanan* Project, sustainable improved productivity in the community can be coupled by collaboration and energetic monitoring of various government agencies that have goals of inclusive growth. The project was led by Bulacan Agricultural State College (BASC) and funded by the Department of Agriculture – Regional Field Office III, amounting to Php 2,000,000.00.

The project aimed to improve the socio-economic conditions of small-scale rice farm families in the rainfed lowlands and upland areas through the promotion and demonstration of integrated and diversified rice-based farming systems directed at improving and sustaining productivity.

MATERIALS AND METHODS

The conceptual framework of the *Palayamanan* model in delivering services to the community adopts the input-process-output-outcome approach for system analysis (Figure 1).

The project was initiated through project orientation with LGUs and farmers, site selection, and validation. This was followed by the establishment of model farms, capacity enhancement of farmers which included Farmers' Field School (FFS), skills training, field days, *Lakbay-aral* and cross visits, participatory technology demonstration (PTD), cropping system, and variety adaptations. Capital roll-over of capital seed money makes up the fund sourcing was available to other farmer-adopters. To ensure sustainability of activities, continuous project monitoring and evaluation were conducted.

Site selection. Ideal farm must at least one hectare area and has potential for rice, vegetables, livestock, poultry and forest product production, and water (system) should be available in every farm. The *Palamayanan* Project was first implemented in the upland areas of Bulacan. Initially, only three municipalities (San Ildefonso, San Miguel and Pandi) were the beneficiaries of the project. Subsequently, it was upscaled to include rainfed lowland of other municipalities including San Jose del Monte, Marilao, and Norzagaray in Bulacan. This project was composed of six major activities, and was adopted by the project team from BASC experts and extensionists. The project components included the following activities: 1) technology scanning, packaging and integration; 2) establishment of model farms; 3) capacity enhancement; 4) information dissemination; 5) financial assistance; and 6) monitoring and evaluation.

Technology scanning, packaging and integration. Inventory and assessment of available and appropriate technologies on agriculture, forestry and natural resources were undertaken. The technologies integrated and demonstrated were as follows:

1. Crop production- Aerobic rice production system, vegetable production (pesticide-free bitter gourd, tomato, eggplant, winged bean, okra, pepper), root crops (cassava, sweet potato and taro), corn, and pineapple
2. Orchard production- mango, rambutan, tamarind, dalandan, and banana
3. Forest tree Production- Narra, Mahogany, bamboo, and Madre de cacao
4. Livestock production- native pig, goat, and sheep
5. Poultry production- native chicken, duck, and turkey
6. Fish production- Tilapia

Management practices needed in the different production components were packaged and followed during the production cycle using a technoguide. Experts were tapped to monitor regularly the status or condition of the growing crops, livestock, fish, orchards and forest trees in the farm. Assessment on soil, land and other resources was also performed. The process was done carefully with the experts and farmers. Outputs of the investigations were summarized in the form of a land use map indicating the location of the different production components to be carried out.

Establishment of model farms. The established and developed model farms were launched and adopted by the implementing agencies as learning venue in the province. Long term plans were drafted to sustain the operation, development and promotion of the farm in partnership with the concerned organizations.

Schedule of establishments was determined based on the existing resources. Complete technology integration was made within a year for proper monitoring and documentation. A sharing scheme with regard to the cost of establishment for every model farm was agreed between the project implementers and the farm owners. Technical assistance and production inputs in some production components were provided from the funds. All labor expenses incurred and investment capital on agricultural facilities were shouldered by the farm owners. Memorandum of Agreement was signed for this purpose for every model farm.

Capacity enhancement. Trainings for farmers on appropriate rice-based farming systems were done through Farmers' Field Schools (FFS). Farmers were exposed to other areas through field visitation, farmers' fora, participatory technology demonstration and other related activities. One hundred twenty farmers were involved as cooperators or 20 farmer-cooperators per model farm or project site excluding farmer-cooperator for each site.

Information dissemination. Information materials such as technoguide, flyers, posters and DVDs were developed, reproduced and distributed to other potential beneficiaries. Organizing field days and cross visits were also done to further disseminate the information and promote appropriate technologies or farming systems for rainfed lowland and upland areas.

Financial assistance. Farmers were given financial assistance but payable at the end of each cropping season with minimal service fee of one percent per month. The project set the priority farming systems to be carried out with financial support. Other production systems or technologies that the farmer established were not supported financially by the project. However, provision of technical assistance and other support services as needed were given.

Monitoring and evaluation. Monitoring and recording of data were done throughout the implementation. Focus group discussions with the farmer-cooperators before the start of the venture was organized to get relevant information needed in the implementation. The significance and projected impacts in general were also discussed with the farmers. Field days were organized before the end of the implementation for the concerned government institutions, private land owners, research institutions, academic institutions, farmers and private companies promoting and selling agricultural products and services. Evaluations of outputs or accomplishments were done after the implementation. Outputs were used as basis for possible expansion or continuation of the project.

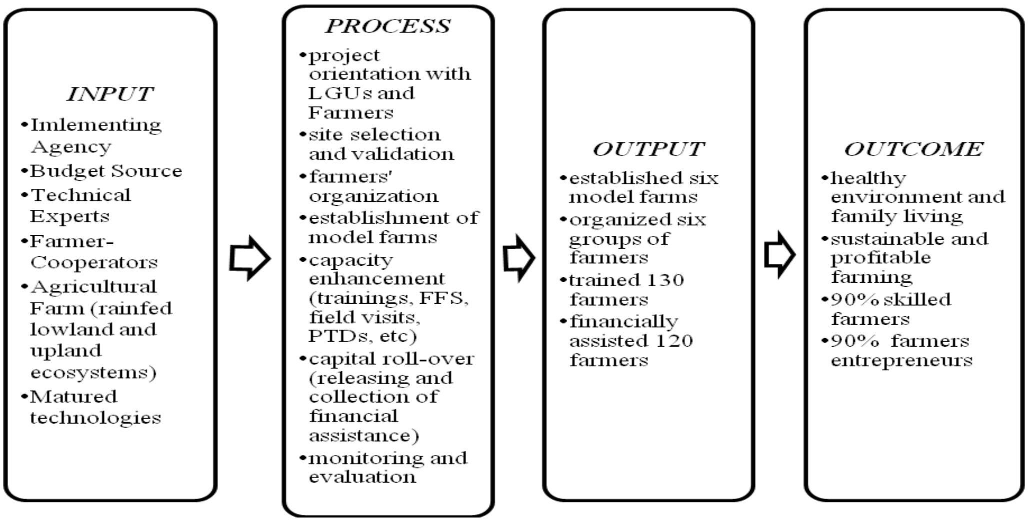

Figure 1. Conceptual framework of the *Palamayanan* Project.

Statistical analysis. The incomes before and after the implementation and adoption of technology intervention of the farmer- cooperators were analyzed statistically using the t-test for dependent samples. T-test for dependent samples is applied to find out the correlation of means of matched pair samples taken from one population (Basilio, et al., 2003; StatSoft, 2017; LAERD Statistics, 2017 and oak.ucc.nau.edu, 2017). The test was evaluated at 5% and 1% levels of significant difference.

RESULTS AND DISCUSSION

After site validation, site characterization was then employed to determine the existing vegetation prior to the layout of the area. Table 1 shows the summary of the description/environmental condition of the different model farms.

Before the layout was made, different factors were assessed including the following: farmer-cooperator's preferences/experiences and farming practices; the availability of natural resources for irrigation purposes and grazing of livestock animals; the topography if it is suitable for crop production, tree plantations, orchards, animal production and/or the integration of the crops and animal production; and the climatic factors which included rainfall and wind.

Plants were also distinguished into various classifications according to environment adaptation particularly its soil, topographic, and climatic requirements. The suggestions of the farmer-cooperator were considered as they knew if the crops to be planted most especially the vegetables were favorable to the selected area. The forest trees were planted according to the purpose as boundary, as shelterbelt and/or to control or prevent the wind and soil erosion. Meanwhile, fruit trees were laid out to the area that would not affect the photosynthetic process of other crops. Poultry and livestock animals were placed to the area that would not affect the production of rice, vegetables and fruit trees, and of course to prevent the contamination of surface and groundwater as well as the presence of heavy metals that could serve as the toxic substances.

Table 1. Summary of model farm description/environmental condition

Model Farm	Description / Environmental condition
Sapang Dayap	The site was considered an upland area consisted of paddy field for rice production, 15% - 20% of the area having a slope of 20% remained idle. The farmer-cooperator practiced the monocropping system because of limited water resources.
Maligaya	The area was composed of 10%-15% slope that was totally idle. There was no vegetation as the area was totally exposed to sunlight and strong wind, no ditches, and presence of different grasses and other unwanted plants. The soil was slightly acidic.
Pandi Marilao	The site was an upland area allocated for rice production only. The area was too near to the small river that was prone to flood and erosion with limited number of trees.
Norzagaray	The area was exposed to strong wind and erosion due to run-off water as the area was too steep with 20%-30% slope. The other part of the area allotted for rice production was too prone to flood as the creek besides the area served as the catchment area. The soil in the upland area was sandy loam and it was slightly acidic.
San Jose Del Monte	The site was planted by vegetables with 5%-10% slope. The area was too much crowded for different vegetation most especially coffees and other fruit trees.

The average annual income of farmers from Norzagaray, San Jose del Monte, San Miguel and San Ildefonso before the adoption of technology interventions belonged to the lowest bracket, below Php 40,000 income bracket (PSA, 2016). On the other hand, farmers from Marilao and Pandi belonged to middle class (Php 60,000-99,999) in terms of income bracket. Although the average annual income of farmers from other parts in Bulacan was in middle class, on the average income (Table 2) of project farmer-cooperators in Bulacan belonged to the lowest income class. After the adoption of technology interventions by the farmer-cooperators, there was increase of average income for the succeeding years. There was a decrease in average income for three consecutive years (2013-2015) in Norzagaray. The income declined because of water shortage in the upland areas that affected the crop production. In Marilao and Pandi, there was a decrease in average income last 2016 which was due to severe rainfall (*Habagat*) and typhoon that devastated their respective areas.

Table 2. Average annual incomes before and after the adoption of technology interventions of farmer-cooperators in Bulacan.

Place	Baseline Income (PhP)	After (PhP)			
		2013	2014	2015	2016
Norzagaray	29,518.52	28,150.00	22,696.43	23,929.67	34,727.27
Marilao	64,111.11	70,800.00	80,321.43	71,857.14	51,457.40
San Jose del Monte	11,409.06	-	22,878.88	29,051.47	23,803.74
Pandi	63,955.56	68,615.96	68,955.56	67,972.38	61,108.81

San Miguel	5,041.18	32,382.00	43,285.29	44,255.56	54,227.78
San Ildefonso	31,825.22	30,564.00	38,321.96	67,910.65	63,164.96
Bulacan (province)	**38,502.03**	**46,730.12**	**43,115.48**	**49,782.54**	**51,185.12**

The average income before the technology adoption of the farmer-cooperators was Php 38,502.03 which belonged to the lowest class. After the adoption of technology interventions, the improved average incomes was Php P46,730.12, Php P43,115.48, Php 49,782.54, and Php 51,185.12 for years 2013, 2014, 2015 and 2016, respectively. There was an improvement in the income class. With the help of financial assistance, the production of crops and animals was possible even during the dry season hence family incomes of farmer- cooperators increased. This could be one of the reasons why there was also a continuous cultivation of area (Figure 2). Analysis is similar with the study of Aguilar (2006) who stated that households with improved access to credit were better able to benefit from technology that increased their incomes than those who do not have access to credit. This also means that poverty when addressed through increase of income, living condition improved. This is also similar to the statement in www.economicshelp.org (2017) that when economic growth overcomes poverty there is a clear link with improved living standards.

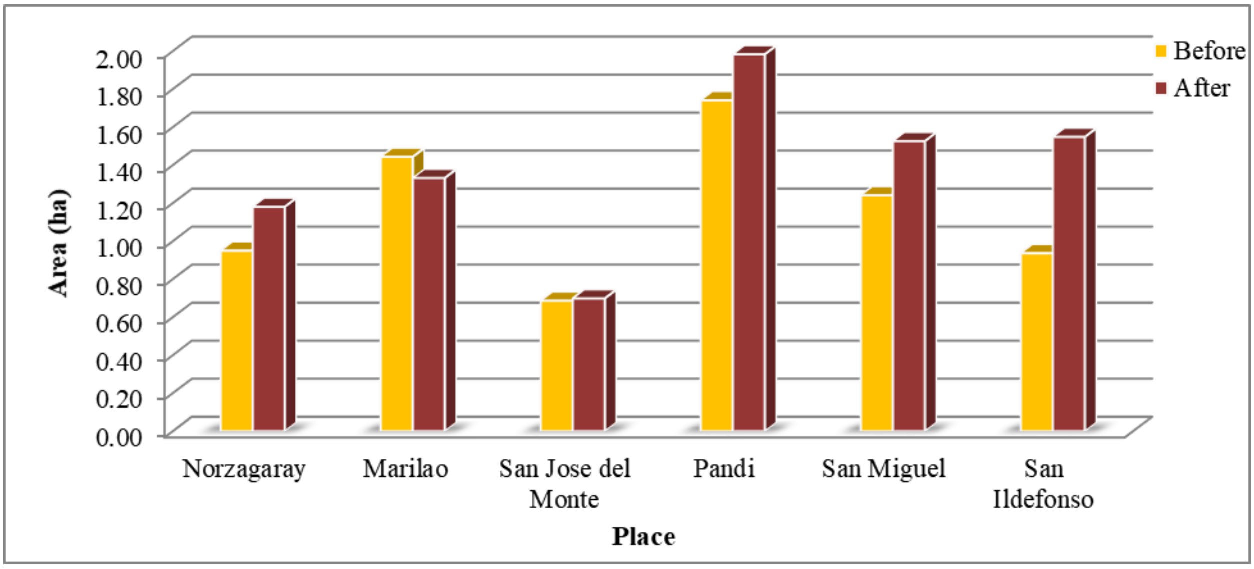

Figure 2. Area used for crop and for animal production.

Although there was a trend of increasing average income after the adoption of the technology intervention, it was still statistically determined if its adoption really had an impact at 5% and 1% levels of significance. The computed t-values were compared at tabulated t-values at different significant levels (Table 3). For the first year of implementation of technology adoption, there was no impact on the income of farmers. This could be due to adjustment to new technologies adopted and the mastery maybe had not yet attained. Usually, impact analysis is done after 3-5 years of implementation and the reason for this could be that the technologies were incorporated to the routinely work of farmers and mastery was achieved. This was also the trend of the technology impact on income in 2016 wherein there was high significance on difference from the previous income of farmers. In Marilao, there was a negative impact which was due to devastation of typhoon and severe rainfall that caused damages to crop production.

Table 3. Statistical analysis of project impact from 2013 to 2016.

Place	Computed t-values			
	2013	2014	2015	2016
Norzagaray	-2.50^{ns}	-1.39^{ns}	-0.80^{ns}	5.14**
Marilao	0.78^{ns}	1.83*	0.88^{ns}	-0.98^{ns}
San Jose del Monte		4.86**	4.26**	2.58**
Pandi	0.65^{ns}	0.74^{ns}	1.04^{ns}	0.91^{ns}
San Miguel	1.00^{ns}	1.52^{ns}	1.85*	2.42*
San Ildefonso	0.27^{ns}	1.43^{ns}	1.46^{ns}	2.54**
Bulacan (province)	1.10^{ns}	-0.42^{ns}	2.37*	3.88**

* significant difference at 5%
** significant difference at 1%
^{ns} no significance
\- negative impact

This means that in general the technologies adopted by farmer- cooperators were effective in improving or increasing their incomes. This outcome is the project desired since it was perceived that if the income increases, the economic living condition of the adopters also improves.

Strong cooperation and commitment among farmer-members, farmer-cooperators, project team, agricultural technicians and the continuous support of LGU and DA-RFO III are the secrets behind the success of the project in the six project sites as evidenced by their sustainable operation even after the duration of the project implementation. The *bayanihan* attitude which was instituted in the minds of the farmers and their sense of ownership for the project kept their commitment for sustainable operation of *Palayamanan* in their community. Farmers' exposure to *Lakbay-aral*, cross visits, field school, skills training, and various social activities capacitated them and developed their self-confidence. In addition, their open reception of new technologies and willingness to change their farming tradition made the implementation of the project much easier. Likewise, the established farmers' organization in each project sites regularly conducted their monthly meeting that further strengthened their bonding together. The capital roll-over scheme of Php 5,000 with only one percent interest rate monthly sustained the project operation.

However, unavailability of service vehicle and conflicting schedules of project staff were the identified weaknesses that hindered them in conducting continuous monitoring of the project. In addition, natural calamities posed an inevitable threat impeding the farmers' farm productivity especially during wet season.

Nevertheless, the success of the project in the six *Palayamanan* sites in Bulacan opens a big opportunity for project expansion in other areas, regional and even nationwide coverage. Availability of service vehicle that can be used for regular visit to the farmers will be a great help for further improvement of the implementation of the project in the future.

Acknowledgements

The project management team would like to express their deepest appreciation to all those who made the implementation of this project possible. A special gratitude is given to the Department of Agriculture – Regional Field Office III (DA-RFO III) for the funding support it provided for the implementation of the project. Likewise, due appreciations are given to the farmer-cooperators and adoptors in the six project sites for their warm welcome to the members of the project team as well for their active participation and support in all the activities conducted by the project team. Many thanks are also given to various individuals who have contributed their energies to the project, namely; the different LGUs in the three municipalities (San Ildefonso, San Miguel, Pandi, Norzagaray, San Jose del Monte and Marilao) along with the Municipal Agriculture Office especially the technicians that have been involved in the project as project site coordinators. Moreover, deep gratitude is also extended to Dr. Arden C. Evangelista, Dr. Helen G. Manalastas, Mr. Marcelo S. Catacutan, Mr. Bernardino P. Nuñez and Mrs. Norma L. Ignacio who served as resource speakers and shared their skills, knowledge and expertise to the farmers during the various trainings conducted.

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