MJSIR
Mountain Journal of Science and Interdisciplinary Research
PRINT ISSN: 2619-7855
ONLINE ISSN: 2651-7744
January-June 2023 • 83 (1) : 82-93

Documentation and Promotion of Using Minisett Technique in Seed Yam Production

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ARTICLE INFO
Date Received: 06-10-2020
Date Last Revised: 11-30-2022
Date Accepted: 03-16-2023

KEYWORDS
yam minisett technique
seed yam
productivity
documentation

Abstract

The study documented the promotion and adoption, and profitability of using minisett technique in seed yam production. It used data collected from six farmers and two yam growers' associations from Benguet, San Mateo Rizal, and Sugpon, Ilocos Sur, based on follow-up field visits and client interviews, documentation of applied technologies in semi-/commercial ventures, set-up of demonstration/observation trials in farmer's field, and document and secondary data reviews. Costs and returns and partial budget analyses were used to determine the profitability of seed yam production using minisett technique. The promotion activities included: season-long training on yam seed production, demo farms on yam minisett production, and distribution of information, education, and communications materials. Results showed that many of the adopters bought from an early farmer-adopter. Results also indicate substantial improvement in yield, size, and quality of tubers using the recommended minisett technology. The net incremental financial benefit obtained from yam tuber production using minisett technique was estimated at PhP4,237.50 in 500sqm. Therefore, promoting yam seed technology through the use of the yam minisett technique increases productivity and availability of planting materials.

Introduction

Yam (*Dioscorea alata*) is one of the priority commodities being pushed for commercial development in the country. The market potential of yam is great considering the demand of the processing industries and food chains in the country. World production of yam was estimated at 58.7 million tons with West Africa producing more than 92% (FAOSTAT, 2014 as cited by Aighewi et al., 2014). However, according to Philippine Statistics Authority (PSA, 2017), the production of yam in the Philippines dropped by 9.5%, from 15.25 thousand MT in 2014 to 13.80 thousand MT in 2015, due in part to a corollary decrease in the total area of production. Central Visayas produced the greatest volume of 5,351 metric tons in 2017, while Cordillera produced 171 metric tons in that period. The decline in yam production can be attributed to poor seed systems, production, and post-production practices. The international market is established but is in danger of being lost due to the limited supply of

quality raw materials for the processing industry and the lack of quality planting materials for the farmers. Most yam farmers use seed tubers saved from a previous crop for propagation. Due to a short supply of quality seed tubers at affordable prices, replacement of stocks of seed yams, which have been infested by pests and diseases, is usually not possible and farmers are forced to recycle poor quality seed yams with the risk of poor yields (Aighewi et al., 2015). In addition, most of the questions raised by the farmers were on the lack of clean and preferred planting materials and varieties, yam diseases, poor tuber qualities, strict market requirements, and limited market outlets for all yam deliveries.

To alleviate these problems of scarcity and the high cost of seed yams, seed production in the country needs to focus on developing sustainable schemes. These schemes can be achieved through the use of technologies like rapid multiplication techniques, for example, the use of yam minisetts. The yam minisett technology was developed to minimize the use of over 30% of harvested tubers as seed. The technology is expected to contribute to the reduction of the cost of planting materials, which accounts for between 33% and 50% of the total production cost (Kambaska et al., (2009) cited in Asante et al., 2014).

The yam minisett technology constitutes the most effective method for the rapid multiplication of seed yam needed for increased and sustained production of the crop (Asiedu, 2012). Minisett production is simple that can be easily adopted by the farmers to produce their own planting setts and commercialize them as a source of additional income. Hence, the problem of the limited supply of affordable good quality planting material continues to be cited in the literature as responsible for low productivity (Aighewi et al., 2014).

Seeds are a strategic input, and yam production cannot expand without propagation technologies to address issues of rapid multiplication of seed yam, quality, and price (Aighewi et al., 2014). The benefit of technologies that address these issues will be evident in increased productivity, which will translate to improved income for producers and utilization opportunities for the crop. Systematic and continuous practice of using only clean seeds will reduce the level of pests and diseases that attack the crop in the field as well as improve the storage life of tubers.

From 2008-2010, the Benguet State University Northern Philippines Root Crops Research and Training Center (NPRCRTC) embarked on yam R&D with funding assistance from various sources. These activities included mass propagation of purple yam seeds piloted with farmers in Benguet and Apayao Provinces; institutionalization of the commercialization of yam minisett multiplication and minituber production for agribusiness and enterprise development; season-long training on yam seed production; demo-farms on yam minisett, minituber, and whole seed size tuber production; and technology documentation and validation. Dispersal of purple yam seedlings were also done in Kalinga.

To help sustain the yam industry, a proposal on "Science and technology-based farm production of quality processing yam tubers in Tuba, Benguet Province" was conceptualized in 2010 to institutionalize seed production and processing yam tuber production in the municipality of Tuba with funding assistance from the Department of Science and Technology-Philippine Council of Agriculture, Aquatic, and Natural Resources Research and Development (DOST-PCAARRD). It was at this point, that documentation of yam seed technologies started.

The advances in information technology made possible the availability of yam production technologies developed elsewhere. In addition, many research results and potential component yam production technologies are unpublished or only in project reports. A variety of methods have been tried to propagate yam. The traditional way is to make use of planting materials from part of the same large tubers harvested for food. The drawback of this method is that over the years, the increasing need for food and cash sales to the food processing market resulted in a shortage of seed tubers, and even a loss of varieties. Hence, research results and technologies on yam need to be disseminated and recommended for adoption by farmers. The NPRCRTC continues to develop production technologies that may evolve from the dissemination-validation-innovation process, as well as gather information to update knowledge on the yam industry. However, there is no documentation available to assess farmers' acceptance, rejection, or modification of these technologies.

This study focused on documenting the productivity of yam production technologies through the adoption of yam minisett technology, describe the yam production practices of early adopters, and determine the change in productivity and profitability as a result of using the technology.

Methodology

The implementing mechanism adopted in this project is a mixed method. The data were gathered through follow-up field visits and interviews of research and extension (R&E) clientele, documentation of applied technologies in semi/commercial ventures, set-up of demonstration/observation trials in farmer's fields, and review of documents and secondary data. Promotional/extension activities through season-long training on yam seed production, demo farms on yam minisetts production, and distribution of Information, Education, and Communications (IEC) materials were also employed.

The documentation was carried out by interviewing the R&E clients (farmer-partners and trainees) using guide questions and in-depth interviews to gather feedback and observations on the adoption process of promoted yam minisett technology and information on yam during the year 2011 to 2016. Data were collected from six farmers and two yam growers/farmers associations from Benguet (Tuba, Sablan, La Trinidad, Tublay, and Kapangan), San Mateo Rizal, and Sugpon, Ilocos Sur (Table 1).

Table 1

Respondents Trained and Recipients of the Yam Project

Yam Producers	Background of Respondents
1. Farmer 1 (Taloy Sur, Tuba, Benguet)	- *Magsasaka -Siyentista* beneficiary of the S&T- Based Farm Technology on Production of Quality Processing Yam Tubers in Tuba, Benguet Province - Trainee of the Season- Long Training on Yam Seed Production
2. Farmer 2 (Bayabas, Sablan, Benguet)	- Recipient of the yam minisett production project bought by DA-SPICACC project from the NPRCRTC-BSU
3. Farmer 3 (Sto. Nino, Ambassador, Tublay, Benguet)	- Trainee of the Season- Long Training on Yam Seed Production - Farmer-partner in yam project of NPRCRTC-BSU
4. Farmer 4 (Patiis, San Mateo, Rizal Province)	- Recipient of the yam minisett production project
5. Farmer 5 (Bahong, La Trinidad, Benguet)	- Trainee of the Season- Long Training on Yam Seed Production - Farmer-partner in the Demo Farms on Pre-rooted Yam Setts Production project of the NPRCRTC
6. Farmer 6 (Datakan, Kapangan, Benguet)	- Trainee of the Season- Long Training on Yam Seed Production - Farmer-partner in the Demo Farms on Pre-rooted Yam Setts Production project of the NPRCRTC
7. Benguet Fresh Produce Multipurpose Cooperative (La Trinidad, Benguet)	- Members served as trainees of the Season- Long Training on Yam Seed Production, conducted by the NPRCRTC - Engaged in cut flower production
8. Sugpon Farmers/Ube Processors Association (Sugpon, Ilocos Sur)	- Recipient of processing trainings by DTI-NPRCRTC - Loaned 160 pcs of pre-rooted yam setts to start their yam seed tuber production

The season-long training on yam seed production followed a simplified farmers' field school approach, where the farmers were encouraged to put into practice what they learned by putting up their own seed nursery and seed farm. This training was implemented as a practical hands-on production guide for the yam farmers/ trainees interested to venture into yam seed tuber production. Starting from the acquisition of planting materials throughout the growing period of the crop, lectures and hands-on applications were done.

Another promotional/extension activity undertaken was through demonstration farms on yam minisett technology. Through this activity, the farmers were encouraged to observe and monitor the growth of the crop and share their experiences. Demonstration farms were established in each of the five municipalities of Tuba, Tublay, La Trinidad, Kapangan of Benguet Province, and San Mateo, Rizal. Preparation and dissemination of IEC materials on yam was another important information activity in the project. The following IEC materials developed and distributed are a) *Magsasakang Siyentista* (MS) Best Practices: Yam Production; b) Yam Sett Multiplication; c) Promising Yam Production Technologies for the Establishment of Purple Yam Seed System; and d) Catalogue of Yam Collection in Benguet, Philippines.

Data analysis was based on the production cost of Farmer 1. The costs and returns analysis of yam production for both the MS farmer practice and the plot with S&T intervention were analyzed after which partial budget analysis was applied. Partial budgeting is used to assess the economic viability of a component technology (PCARRD, 2008). In addition, a partial budget includes only the costs and outputs which alter as a result of the proposed change or technology adoption.

Results and Discussion

Promotion and Adoption of Yam Minisett Technology

From 2011 to 2016, follow-up field visits and informal interviews of research and extension clients and adopters were employed to gather feedback and observations on the adoption process of promoted technologies (varieties and use of yam minisett, +/- 100g pre-rooted setts) and information on yam.

The yam minisett cutting process adopted by farmers was introduced during the season-long training on yam production to improve the system of yam production (Figure 1). The yam minisett cutting process adopted by farmers includes the following: a) each cut sett weighed about 50 to 100 grams; b) cut setts were treated by dusting/ dipping the cut portion in fine wood ash mixed with fungicide; c) cut setts were air dried to cure for few hours; d) yam setts were observed if they have sprouted at 30 to 45 days, or have about two to five inches sprout length, which is ideal for planting for uniform growth and maturity.

Adopters of Yam Minisetts Technology

Farmer 1 - Magsasaka-Siyentista of Tuba, Benguet, and former trainee of season-long training on yam seed production in 2009, and an implementer or beneficiary of Science and Technology (S&T) -based farm on yam production project (2010-2012), who was visited and monitored during the growing period up to the harvesting of the yam seed crop. In 2012, the project conducted a technology field day and during that activity, 29 farmers were given free 15 kilograms each of yam seed tubers to adopt the intervention technologies. Most of the potential adopters were from the municipalities of Sablan, Tuba, Bokod, and Itogon of Benguet. Considering the big demand of farmers for planting materials, farmer 1 produced and supplied yam seed tubers and sett cuttings to farmers from Kapangan (3,147 kg), Atok (500 pre-rooted yam setts), Sablan (500kg seed tubers), Ifugao State University (800 pre-rooted yam setts), and others through the Department of Agriculture-Cordillera Administrative Region (DA-CAR) and BSU-NPRCRTC.

Farmer 2 of Sablan, Benguet was a recipient of the pre-rooted yam setts bought by the Department of Agriculture- Strengthening Philippines' Institutional Capacity to Adapt to Climate Change (DA-SPICACC) project from the BSU-NPRCRTC.

Farmer 3 of Sto. Nino, Ambassador, Tublay, Benguet is a member of the Benguet Fresh Produce Multipurpose Cooperative and also one of the trainees of the season-long training on

Figure 1

Yam Minisett Cutting Process Adopted by Farmers

yam seed production in 2016. Prior to this, he visited the NPRCRTC to inquire about yam. The Center initially arranged with him to be one of the farmer-partners of the project, until such time that one of the projects in yam R&D was conducted on his farm in Tublay, Benguet.

Farmer 4 of Patiis, San Mateo, Rizal Province acquired 100kg of yam seed tubers of Sampero variety from Farmer 1 as initial planting materials for yam production. During the delivery of the said planting materials, the sett cutting technique was demonstrated and IEC on yam sett multiplication was provided. However, the project team was not able to visit the farm due to limited time and no sufficient budget for monitoring. Nevertheless, the client informed us that he is satisfied with the yield when using the minisett technique.

The Benguet Fresh Produce Multipurpose Cooperative sourced out 150kg yam seed tubers (Sampero and Mindoro varieties) from Farmer 1. These tubers were cut into setts during the season-long training on yam seed production. Two members of the group (Farmer 5 of La Trinidad and Farmer 6 of Kapangan) planted the pre-rooted setts in June 2016. They were visited in August and September 2017, respectively.

Sugpon Farmers/Ube Processors Association is a recipient of 150 pre-rooted yam setts given by the DA-SPICACC project.

Recommended and Promoted Varieties Adopted

Choosing the right varieties for seed yam tuber propagation is very important. The first consideration adopted by the farmers is the preference of the yam processors and market buyers or the varieties demanded by the market, i.e. the violet or purple flesh varieties, with regular to moderately irregular round to elongated shapes, and good cooking or processing characteristics. Other characteristics considered are varieties resistant to pests and diseases, and high- yielding varieties.

Recommended varieties/accessions NPY 007 -*Dimdima/Ramay-ramay*, NPY 008/016-*Tungkol Mindoro*, NPY 025, NPY 034/036- *Sampero*, NPY

043, NPY 052, NPY 054/060- *Tungkol, Padinse*), NPY 055, NPY 073, *Bohol*, and *Mindoro* were promoted and adopted in the project since these are the most preferred by the processors because their purple flesh, good cooking, and processing characteristics.

Productivity of Yam Minisett Technology

Production and Innovation Practices

The production and innovation practices of the farmers/respondents are presented in Table 2.

Minisett technique using smaller, +/- 100g pre-rooted setts was introduced as planting materials. Several methods of rapid multiplication have been developed to speed the production of yam planting material (Wilson, 1989). One of these methods is minisett rapid multiplication. This method produces small, whole planting setts, each weighing 200 to 800g, from minisetts as small as 25g. The minisett technique has been shown to have several advantages over traditional methods of seed tuber production.

Table 2

Yam Production Practices Adopted by the Farmers

Farmer-Client	Production Practices
1. Farmer 1 (Taloy Sur, Tuba, Benguet)	- Adopted smaller yam sett size of Sampero weighing 75 to 100g and uses of ash for sett treatment. - Planted in an area of 500sqm. each in 2011 (600 hills -S&T and 350 hills -MS - Demonstrated in a sloping to flat terrace terrain with a planting distance of 0.75x0.75 meters. - Employed proper cultural management with technical assistance from the technical expert/ focal person from NPRCRTC in collaboration with PCARRD (S&T-based on the yam project) - Intercropped cash crops such as ginger, taro, paco or edible fern, native *ampalaya,* and pineapple.
2. Farmer 2 (Bayabas, Sablan, Benguet)	- Planted 150 out of 200 pre-rooted yam setts a month after the delivery - Planted in newly cleaned swidden farm intercropped with ginger, pechay, and border crop of *galiang* or tannia
3. Farmer 3 (Sto. Nino, Ambassador, Tublay, Benguet)	- Yam sett of 19 accessions/ varieties (purple flesh) weighing 50 to 100g was planted in an area of 500sqm. - 389 hills (flat terrain- monocropping) in Sto. Nino, with a planting distance of 0.75x0.50m - Employed proper cultural management with technical assistance from the NPRCRTC project team
4. Farmer 4 (Patiis, San Mateo, Rizal Province)	- Planted in a newly operated sloping area using 75 to 100g of yam minisetts of Sampero variety
5. Farmer 5 (Bahong, La Trinidad, Benguet)	- Planted yam setts of *Sampero* and *Mindoro* (75 to 100g) in 8 plots or 360 hills
6. Farmer 6 (Datakan, Kapangan, Benguet)	- Planted 200 yam setts of *Sampero* and *Mindoro* (75 to 100g)
7. Sugpon Farmers/Ube Processors Association (Sugpon, Ilocos Sur)	- Planted the pre-rooted yam setts in a tree-shaded sloping area near the house - Other members also planted the pre-rooted setts around trimmed trees and the rest were planted with sweetpotato - A total of 160 pre-rooted yam for the Association

Yield Performance of Pre-Rooted Yam Setts

Table 3 presents the yield parameters obtained from yam setts planted by farmer-clients. The results show that Farmer 3 had the highest average yield (1,835g/hill) making use of 19 accessions/variety pre-rooted yam setts and with yam sett size averaging 75g. This variety was planted in an area of 500sqm. on flat terrain–following a monocropping and with a planting distance of 0.75x0.50 meters. Better growth and yield performance of yam minisetts can be attributed to proper cultural management of the crop.

Results also show the yield in comparison between *Magsasaka-Siyentista* (MS) – Farmer 1 practice and the S&T intervention. Under the Farmer 1/MS practice the yield produced smaller tubers with an average of 336 grams per hill. Tubers gathered under the intervention obtained an average of 859 grams per hill which is higher than that of the MS practice. Results indicate substantial improvement in yield, size, and quality of tubers using the recommended technology, compared with MS practice. It was a practice of the MS (Farmer 1) to intercrop cash crops on her yam farm such as ginger, taro, paco or edible fern, native ampalaya, and pineapple. In this practice, she earned an additional income. Intercropping cash crops can help enhance the production and value addition of yams grown. Agbarevo (2014) reported that the adoption of improved technological innovations by resource farmers would lead to an increase in farm yields.

Estimated Cost of Pre-sprouted/Rooted Yam Sett Production

Seed yams are the planting materials used in the field production of ware or table yams consumed as food. The costs of obtaining seed yam constitute about 50% of the total cost of production. Conventionally, the tuber is the only means of propagation for white yam and it is very expensive. Traditional yam production is faced

Table 3

Yield Performance of Pre-Rooted Yam Setts/Minisett Grown by the Farmers

Farmer	Variety	Ave. Sett Size (g)	Average Yield (g/hill)	Total Yield (kg)
1. Farmer 1 (Taloy Sur, Tuba, Benguet)	*Sampero*	88	859 (S&T Intervention) 336 (MS Practice)	515 118
2. Farmer 2 (Bayabas, Sablan, Benguet)	*Sampero*	88	325	49
3. Farmer 3 (Sto. Nino, Ambassador, Tublay, Benguet)	19 accessions/varieties (purple flesh)	75	1,835	714
4. Farmer 4 (Patiis, San Mateo, Rizal Province)	*Sampero*	88	No data	No data
5. Farmer 5 (Bahong, La Trinidad, Benguet)	*Sampero & Mindoro*	88	180	65
6. Farmer 6 (Datakan, Kapangan, Benguet)	*Sampero & Mindoro*	88	Low yield due to typhoon Lawin during the growth stages of the crop	No data
7. Sugpon Farmers/Ube Processors Association (Sugpon, Ilocos Sur)	*Sampero & Mindoro*	88	350 (*Sampero*) 500 (*Mindoro*)	56 80

with many constraints, including high cost and/or unavailability of seed yams for planting. Up to 33% of yams otherwise available for food are reserved for planting new crops (Okoli et al., 1982 cited in Oguntade et al., 2010).

Table 4 shows the costs and returns in pre-sprouted/rooted yam sett production. The net income or profit of yam sett was PhP5.04 with the cost of production and the cost of labor accounting for at least 50%. These estimates show that seed yam production using the minisett technology can be a profitable venture in the study area.

Profitability of Yam Production Using Minisett Technology

The adoption of any technology by farmers is dependent on the economic benefit they receive. Table 5 presents the costs and returns of producing quality yam tubers in 500sqm. using the minisett technique, while Table 6 shows the partial budget analysis. Data analysis was based on Farmer 1 (*Magsasaka-Siyentista*) located in Taloy Sur, Tuba, Benguet. The Science and Technology Based Yam Farm was demonstrated in the 500 square meters area owned by the Farmer 1 (*Magsasaka-Siyentista*) located in Taloy Sur, Tuba, Benguet. These demonstration plots were implemented from April to January in a sloping to flattened terrain with planting distances of 0.75m x 0.75m between hills. The existing nearby yam farm of Farmer 1 (*Magsasaka-siyentista*) was also maintained for comparison with the S&T intervention. The areas used were of similar topography.

Results show that the total cost of producing quality yam tubers in 500 square meters amounted to PhP15,612.50 (Table 6). This production cost includes the material inputs, depreciation costs, and labor. The cost of production is affected by the quantity and price of the inputs used and yield is affected by crop management practices, inputs used, and environmental/physical factors. Yam production entails high labor costs, especially for land preparation, weeding, and harvesting/hauling (Table 5).

Comparing the S&T intervention (use of

Table 4

Costs and Returns in Pre-Sprouted/Rooted Yam Sett Production

Details	Total		Cost/pre-sprouted yam sett
	Qty	PhP	PhP
Gross Returns			
Number of pre-sprouted/rooted setts produced	2,989 setts	29,890.00	10.00
Production Cost			
Yam tubers purchased – *Sampero/Tungkol* including handling costs	298.16 kg	7,914.20	
Pre-rooting medium (alnus compost)	20 sacks	1,500.00	
Fungicide	200 g	375.00	
Wood ash	5kg	100.00	
Disinfectant	1 L	120.00	
Detergent	1 kg	120.00	
Labor (including costs of snacks)	15 mandays	4,503.00	
TOTAL		14,632.20	**4.96**
Net Income		15,257.80	**5.04**

Table 5

Cost and Return Analysis of the Production of Yam Through the Use of Yam Minisett Technique, in Comparison with Farmers' Practice Between the S&T Intervention, 500m²

Items	MS Practice			S&T Intervention		
A. Production Cost	Qty. used	Price/unit	Total	Qty. used	Price/unit	Total
Farm Supplies						
Yam seeds	46 kg	25/kg	1,150.00	60 kg	25/kg	1,500.00
Stakes	350 pcs	0.75/pc	262.50	1800 pcs	1.50/pc	2,700.00
Compost:						
Alnus compost				18 sacks	60/sack	1,080.00
Rice Hull				18 sacks	50/sack	900.00
Horse manure				18 sacks	100/sack	1,800.00
Depreciation cost (Kayabang, crates, watering cans, trolley)			100.00			545.00
Sub-total			**1,512.50**			**8,525.00**
Labor/activities	man-days		Total	man-days		Total
Land preparation	6	200.00	1,200.00	9	200.00	1,800.00
Sett cutting				1	200.00	200.00
Digging				6	200.00	1,200.00
Digging/planting	3	200.00	600.00			
Compost application/ Planting				6	200.00	1,200.00
Staking				6	200.00	1,200.00
Staking/gathering	5	200.00	1,000.00			
Weeding – 1 to 3x	8	200.00	1,600.00	33	200.00	6,600.00
Harvesting/hauling	6	200.00	1,200.00	10	200.00	2,000.00
Sub-total			**5,600.00**			**14,200.00**
Total Cost			**7,112.50**			**22,725.00**
B. Gross Returns						
Average yield/hill, g			336.00			859.00
Total no. of hills			350.00			600.00
Total yield, kgs			118.00			515.00
% increase in yield						23.00
Price/kg			50.00			50.00
Gross Returns			**5,900.00**			**25,750.00**
C. Total Net income			**(1,212.50)**			**3,025.00**
Net Profit-Cost Ratio			**(0.17)**			**0.13**

minisett technique) with the *Magsasakang Siyentista* (MS) practice using partial budget analysis, the estimated net financial impact of the intervention realized from 500sqm of yam tuber production is PhP4,237.50 (Table 6). This result suggests that the yam tuber produced using the intervention resulted in positive net income. But since the costs of inputs are high, it is recommended to consider intercropping with other crops for additional income to maximize the area. Ginger and gabi can be intercropped with yam for an additional gross return of as much as PhP16,500 from ginger, and PhP3,000 from *gabi* corms/cormels and stalks.

Published studies to date have suggested that seed yam production in Nigeria using minisett (~0.025kg) technology or an adapted form of the technology using larger setts (0.08 to 0.1kg) was not profitable (Ibana et al., 2012). But these studies were often conducted under artificial conditions where labor inputs may have been inflated. But farm income and productivity could still be further enhanced with the adoption of practical and profitable intercropping practices. The intercropping practice will help in maximizing the space of the area.

According to Food and Agriculture Organization of the United Nations (FAO, 2017), increasing agricultural productivity can happen through improved use and management of agricultural

Table 6

Partial Budget Analysis of Yam Production Through the Use of Minisett Technique and the Application of Better Cultural Management, 500m² Area

Costs		**Benefits**	
(A) Added Costs	Amount(PhP)	**(C) Reduced Cost**	Amount(PhP)
Material inputs			
Yam seed cost	350.00		
Cost of stakes	2,437.50		
18 sacks alnus compost	1,080.00		
18 sacks rice hull	900.00		
18 sacks horse manure	1,800.00		
Depreciation cost	445.00		
Labor			
Land Preparation	600.00		
Sett cutting	200.00		
Digging	600.00		
Planting/compost application	1,200.00		
Staking	200.00		
Weeding	5,000.00		
Harvesting/hauling	800.00		
Total Added Cost	**15,612.50**	**Total Reduced Cost**	**0.00**
(B) Reduced Income		**(D) Added Income**	
Total Reduced Income	**0.00**	Increase in yield by 397 kg@PhP50/kg	19,850.00
Total	**15,612.50**	**Total Added Income**	**19,850.00**
Estimated Net Income Change: (C+ D) – (A+ B)			**4,237.50**

biodiversity resources (such as seeds, pollination, beneficial fauna, etc.), to achieve higher yields while promoting the sustainability of the farming systems and progressing from subsistence farming to market-oriented agriculture. This will also contribute to implementing adaptation strategies for climate change.

Conclusions

This study documented the experience of adopters in producing yam using minisett technology. Farmers who used the minisett technology produced heavier tubers per hill under the same conditions indicating substantial improvement in yield, size, and quality of tubers using the recommended technology, compared with farmer practice. This conclusion implies that minisett technique is an effective method of seed propagation because fewer ware tubers are being used as seed, and the rate of multiplication is faster than with traditional methods. Therefore, this technique can solve the problem of lack of planting material that aims to produce a large number of small and whole tubers for planting materials. The partial budget analysis showed an estimated net financial impact of using minisett technique in a 500sqm. of yam tuber production amounting PhP4,237.50. Yam production using minisett technique is capable of ensuring better income and sustained productivity among the yam producers.

Recommendations

To ensure better profitability and productivity in yam production, and to sustain the yam industry it is recommended that: (1) for profitable minisett production, the farmer should minimize the use of resource inputs to lower production costs, and/or maximize yields, thereby, increasing income; (2) crop diversification or intercropping yam with other cash crops is also recommended to have an additional income from the same land area; (3) yam producers are advised to adopt innovations on yam production such as good quality seed yams, employ the proper cultural management in yam production for better soil structure, yam growth, and good yield to improve productivity and income; (4) the government should commercialize seed production and processing yam tuber production through minisett rapid multiplication and make it available and affordable for farmers to sustain the yam industry; and (5) proposal development and fund sourcing are needed to follow up and monitor technology adoption and innovations and continue extension support services for yam producers.

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