

Addressing Food Security: *Saba* Banana and Rootcrops as Alternative Food Staples to Rice in Quezon Province, Philippines

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ABSTRACT. The Philippines considers rice self-sufficiency as vital to food security; hence, possible alternative food staples are being identified in case of persistent shortfalls in domestic rice production. This paper explores the potential of *Saba* (cardava) banana, sweet potato, potato, yam, and cassava as alternative staples for the local communities in the Quezon province, Philippines, which grow all these crops. Socio-economic surveys of 375 farmers, 82 traders, and 625 consumers were conducted in 2013 but covered crop year 2012. Results showed that *Saba* banana, sweet potato, and cassava had the highest demand among the five crops based on per capita consumption. These crops ranked top three in terms of possible substitutes for rice. However, willingness to substitute is largely for breakfast and relatively less for other meals. While findings indicated a demand for alternative crops, average yield per hectare and production per farm of each of the five crops were low as compared with the provincial average. Despite low production levels, a greater proportion of total produce was marketed reflecting the crops' marketability and potential as additional income source. Recommendations on how to intensify production and to encourage rice substitution particularly with *Saba* banana, sweet potato, and cassava are forwarded.

Keywords: *Saba* banana, root crops, rice substitution, consumption, marketing

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INTRODUCTION

At the 1996 World Food Summit, food security was defined as a condition “when all people at all times have access to sufficient, safe, and nutritious food to maintain a healthy and active life.” It involves complex and multifaceted issues influenced by culture, environment, and geographic location (The Economist Intelligence Unit, 2016).

Food security can be measured by various means. The Philippines uses the Food Security Index (FSI), which involves three aspects, namely: food availability, accessibility, and utilization (PhilFSIS, 2013). PhilFSIS (2013) defines food availability as the dimension that addresses the supply side of food security, wherein indicators measure quantities of quality food from domestic agriculture production or import, while food accessibility refers to the economic and physical resources needed by individuals to acquire appropriate foods for a nutritious diet. Meanwhile, food utilization, according to PhilFSIS (2013) is “the ability of the human body to ingest and metabolize food through adequate diet, clean water, good sanitation, and health care to reach a state of nutritional well-being where all physiological needs are met.” A fourth dimension relates to the stability of the food and nutrition status, which emphasizes the vulnerability of and risks faced by households as well as their resilience by way of adopting livelihood strategies and coping mechanisms when they are hit by temporary negative shocks (Pieters, Guariso, & Vandeplass, 2013).

However, Cabanilla (2006) noted that the country’s objectives of food security has been equated with self-sufficiency in rice and corn. The Philippines’ high reliance on the sufficient supply of rice, in particular, can still be gleaned from the Philippines Food Staples Self-sufficiency Program (FSSP) 2011-2016. The FSSP’s target was to achieve rice self-sufficiency for the country by 2013 and maintain it through 2016 (Department of Agriculture, 2012). The program argues that self-sufficiency in rice must be pursued since it can only be bought from few sources such as

Thailand, Vietnam, Pakistan, India, and the USA. Demand for rice is also growing in non-traditional rice-eating African countries; hence, sufficient quantities of rice in the world market cannot be assured.

However, rice production systems, as stated in the FSSP, are vulnerable to climate change including those in large producing countries like Vietnam and Thailand. Consequently, rice exports of these countries are expected to decline, and this may limit the amount that could be bought by importing countries like the Philippines. Less importation may lower the country's buffer stock, which could not be augmented from local production because of the series of El Niño and La Niña phenomena that historically affects rice production. Until 2016, the country remains below the rice self-sufficiency level.

The FSSP 2011-2016 emphasized the importance of non-rice food staples such as white corn, cassava, sweet potato, and *Saba* (Cardava) banana. These are usually eaten solely or in combination with rice in some rural areas in the Philippines. The share of these items in total food intake has declined over time, but they continue to be significant in many local diets, particularly for households living in remote areas and in adverse environments. Corollary to this, Portilla and Pagaduan (2014) mentioned that scientists have identified rice alternative staples such as *Saba* banana, cassava, sweet potato, taro, and yam.

Among the strategies identified in the FSSP 2011-2016 is the management of the demand of food staples by diversifying consumption and intensifying the production of other staples. The program encourages planting of non-rice staples and raising productivity to address food security at the household level. This food security problem is especially true for farmers in less favorable environments such as rainfed lowlands, low-elevation uplands, and higher-elevation rice-based areas.

The five alternative crops are grown and also serve as staples in other countries. For instance, sweet potato ranks sixth as food crop after rice, wheat, potatoes, maize, and cassava

particularly in developing countries where 95 percent of the global sweet potato output is produced (International Potato Center, n.d.). Yam is planted in tropical regions worldwide such as in Southeast Asia, but production is heavily concentrated in West Africa accounting for about 90 percent of the total output. However, yam is normally raised as an intercrop (CGIAR Technical Advisory Committee, 1997). Taro is also an important crop in the Asia-Pacific region where it provides food security and serves as a cash crop according to the Food and Agriculture Organization (Onwueme, 1999). The Philippines is among the biggest producers of taro along with other Asian countries such as China, Japan, and Thailand. Meanwhile, cassava is grown widely in African countries such as Nigeria and Ghana (Stumpf, 1998). Another significant crop in Nigeria is plantain banana, which is not only a staple food for rural and urban households but also a source of income particularly for smallholder farmers (Nwaiwu, Eze, Amaechi, & Osuagwu, 2012). Because of the importance of highland bananas as starchy food and cash crop, the Government of Uganda in its National Development Plan 2010-2015 has targeted high agricultural productivity for key staple crops such as bananas to alleviate poverty in rural areas and to ensure national food security (Nyombi, 2013).

In the Philippines, *Saba* banana, cassava, sweet potato, taro, and yam are all raised in Quezon, the country's sixth largest province. Quezon has a total land area of 870,660 ha, 59 percent (513,681 ha) of which is classified as agricultural (Quezon Provincial Government, n.d.). Coconut is the primary crop grown in the Province (325,545 ha), followed by rice (60,767 ha) and banana (5,658 ha). The Quezon Provincial Commodity Investment Plan (PCIP) in 2016 mentioned that Quezon is a major producer of other food staples (e.g., cassava, sweet potato), supplying the Province 83 percent or 67,680 mt of alternative staple foods in the region per year as opposed to about 17 percent combined production of the remaining four provinces (Provincial Government of Quezon, 2016). Thus, the Province states in its PCIP (2016) that "the stability of rice production in Quezon has a very large impact on the whole region and to the attainment of 'national food security' by extension." Its contribution to

the volume of alternative food staples is another reason for the Province's importance in improving food security (Provincial Government of Quezon, 2016).

Though known to be grown in Quezon, there are hardly any empirical studies on the potential substitution of alternative crops to rice and demand for these crops in the Province. Hence, this paper analyzed the demand for *Saba* banana, cassava, sweet potato, taro, and yam and the possibilities of substituting these crops to rice. Production as well as the proportion marketed and market outlets were also examined.

METHODOLOGY

Primary data were gathered in 2013 through the conduct of socio-economic surveys of farmers, traders, and consumers of these crops in the cities of Lucena and Tayabas and in the municipalities of Candelaria, Dolores, and Sariaya. A large part of the two cities is still primarily rural. Lucena City belongs to the top five producers of *Saba* banana, and its urban part is a key commercial area in Quezon. Sariaya is one of the five largest producers of sweet potato and cassava, while other areas are basically producers of all the selected crops. The *Bagsakan* Center, a central trading post in the Province, is located in Sariaya.

The surveys, which covered the year 2012, selected randomly three types of respondents: 375 farmers, 82 traders, and 625 consumers (Table 1). Some respondents belong to multiple types, i.e., a respondent may be a producer, trader, or consumer of more than one crop. For instance, consumers include 1) consumer-producers or those who produce (the farmers) and at the same time consume the crop; and 2) consumer-buyers or those who buy these for consumption.

Using structured interview schedules, information was gathered on production, area, yield, degree of commercialization and market outlets for the crops, demand potential, consumption levels, factors affecting demand for the crops, and possible

Table 1. Distribution of survey respondents by type and crop, Quezon, 2012

CROP	TYPE OF RESPONDENT		
	Farmers	Traders	Consumers
<i>Saba</i> banana	319	44	621
Sweet potato	216	33	570
Cassava	159	54	602
Taro	220	41	557
Yam	139	16	506
All	375	82	625

substitution of the crops for the main staple, which is rice. The surveys were supplemented by key informant interviews and focus group discussions with local agriculture officers and a farmers' group called the Tayabas Federation of Farmers Association. Secondary data were likewise obtained from the Bureau of Agricultural Statistics (BAS), now part of the Philippine Statistics Authority (PSA), and its provincial office in Quezon.

The data were processed and summarized using descriptive statistics such as means, totals, and percentages. They were presented in tabular or graphical form as appropriate. T-test was used to determine if there was any significant difference in per consumption of consumer-producers and consumer-buyers. Multiple regression analysis involving ordinary least squares (OLS) method was employed to determine significant variables affecting the demand for these commodities. The demand functions shown in a generalized form below were estimated using the STATA software.

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \varepsilon$$

Where:

Y = per capita consumption of commodity (kg/person/year)

X_1 = age of consumer (years)

X_2 = educational attainment (years)

X_3 = household size (number)

X_4 = monthly household income (PhP)

X_5 = own price of commodity (PhP/kg)

X_6 = price of rice (PhP/kg)

α = Y-intercept or value of Y when X_s are 0

β = slope coefficients, each indicating the change in Y for a given change in X , other factors constant

ε = error term

RESULTS AND DISCUSSION

Demand for the Alternative Crops

For any of the five crops to be considered as an alternative to rice, the demand for them was established based on perceptions of farmers and traders as well as on consumption patterns. The farmer-respondents were asked to rank the five crops from 1 to 5, with 1 being the most in demand and 5 the least in demand. Among the five alternative crops, *Saba* banana got the highest ranking, while cassava came in second, followed by sweet potato (Figure 1). Meanwhile, traders ranked *Saba* banana first and sweet potato second.

As to consumption of the five crops, majority of the consumers consumed these as snack food (Figure 2). A considerable proportion of yam consumers (42%) consumed these as dessert, while a substantial share (28%) of taro consumers used these as ingredients to viands. Some *Saba* banana (18%), sweet potato (11%), and cassava (6%) consumers substituted these commodities for rice.

Table 2 shows that consumer-producers generally had higher per capita consumption than consumer-buyers. Among the five crops, *Saba* banana registered the highest per capita consumption. It is the only crop that was bought twice a month,

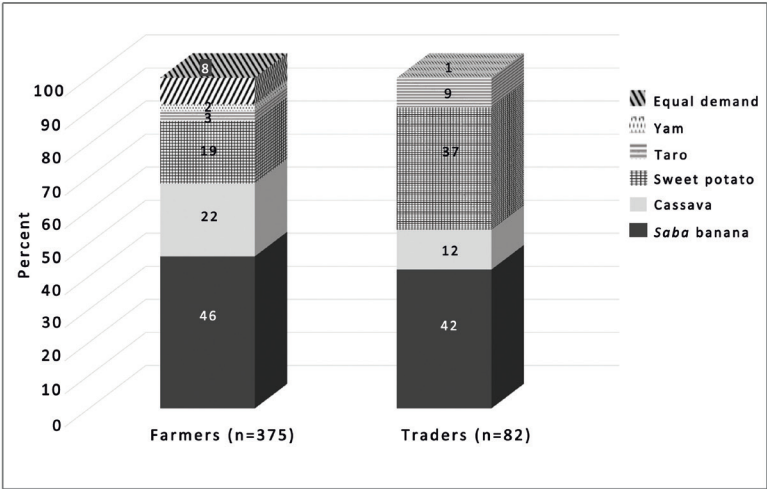


Figure 1. Proportion (%) of respondents who ranked the commodity as having the highest demand, Quezon, 2012
(Pabuayon, Pantoja, Manila, & Santos, 2014)

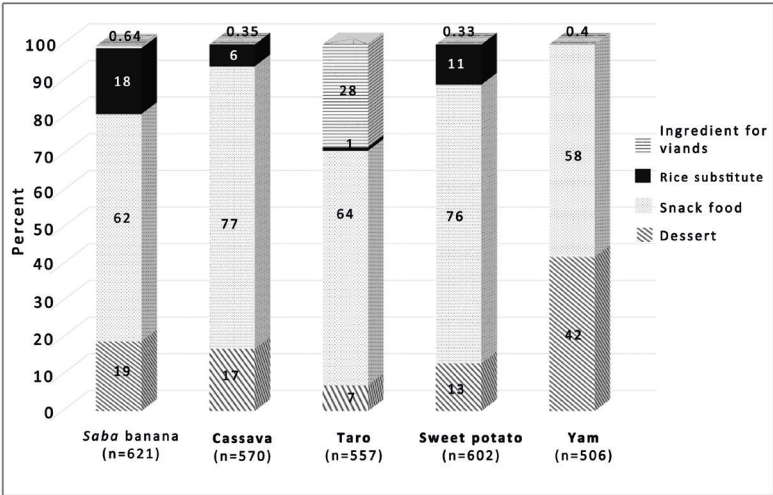


Figure 2. Purpose of consumption by crop, Quezon, 2012
(Pabuayon et al., 2014)

Table 2. Frequency of buying and per capita consumption, by commodity, Quezon, 2012

CROP/ITEM	CONSUMER-PRODUCERS	CONSUMER-BUYERS	DIFFERENCE
<i>Saba banana</i>			
Frequency of buying		2x/month	
Per capita consumption: Survey (kg/year)	26.61	20.58	6.0326ns
BAS provincial	14.61	14.61	
<i>Cassava</i>			
Frequency of buying		1x/month	
Per capita consumption: Survey (kg/year)	20.07	4.92	15.1473***
BAS provincial	3.28	3.28	
<i>Sweet potato</i>			
Frequency of buying		1x/month	
Per capita consumption: Survey (kg/year)	10.28	4.64	5.6423***
BAS provincial	4.47	4.47	
<i>Taro</i>			
Frequency of buying		1x/month	
Per capita consumption: Survey (kg/year)	3.38	2.25	1.1342***
BAS provincial (2011)	1.09	1.09	
<i>Yam</i>			
Frequency of buying		1x/year	
Per capita consumption: Survey (kg/year)	1.73	0.43	1.2999***
BAS provincial (2011)	0.17	0.17	

***Significant at 1% probability level, ns: not significant at 10% probability level
Source: Pabuayon et al., 2014

and it was the most commonly purchased crop by both consumer-producers and consumer-buyers resulting in the non-significance of the difference in consumption between the two groups. Cassava, sweet potato, and taro were bought only once a month, and yam, only once a year, mainly for festivities such as fiesta or Christmas holidays. Yam also recorded the lowest per capita consumption. The per capita consumption in the study sites of all these crops was higher than the provincial averages reported by BAS (2013).

Secondary data on the demand and supply situation of the five commodities were gathered from the BAS central and provincial offices. Results indicated that there was a surplus for sweet potato, cassava, and taro while there was a deficit for *Saba* banana and yam. These findings were consistent with the survey findings.

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Factors affecting demand for the crops. Table 3 shows that the R^2 values derived from the regression analysis on factors affecting demand for each commodity was low, which is not uncommon in social science and demand studies involving cross-sectional analysis. Although this implies that the estimated equations did not have much predictive power, the F-values indicated that the equations generally had good fit. Moreover, there were significant variables from which interesting insights could be derived.

The significant variables for *Saba* banana and sweet potato included age, education, monthly household income, price of the crop, and price of rice. Education, own price, and price of rice were the significant variables for cassava, while only one variable was significant for taro (own price). For yam, education and own price

Table 3. Regression results showing the relationship between per capita consumption and explanatory variables on age, household size, household monthly income, education, own price of the commodity and price of rice (double-log)

CROP/ITEM	<i>SABA</i> BANANA	CASSAVA	SWEET POTATO	TARO	YAM
Age	0.4961**	0.5924***	-0.0539ns	0.0864ns	-0.1791ns
Education	-1.3629***	-0.3609**	-0.3711***	0.0527ns	0.6011***
Household size	-0.2044ns	0.1303ns	-0.0906ns	-0.0736ns	0.0087ns
Monthly household income	-0.4720***	-0.4165***	-0.0643ns	0.0676ns	0.0559ns
Own price	-0.5849**	-1.4108***	-0.6224***	-1.0159***	-0.4001*
Price of rice	-2.4268**	2.5654***	0.5277*	0.1925ns	0.6887ns
Adj. R ²	0.1501	0.2608	0.1292	0.1790	0.0778
F-value	17.87	30.23	11.21	14.01	4.22
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0005

***Significant at 1% probability level, **Significant at 5% probability level,

*Significant at 10% probability level, ns: not significant

Source: Pabuayon et al., 2014

were significant variables to the consumers. For all the alternative crops, the significant variables were age (positive), education (negative), monthly household income (negative), and own price (negative). However, the sign of price of rice was positive for sweet potato and cassava but negative for *Saba* banana.

These results imply that, other things being the same, older consumers ate more *Saba* banana and sweet potato than younger ones. Consumers with higher educational attainment tended to consume less *Saba* banana, sweet potato, and cassava, probably because they knew of other commodities that could provide them better nutrition. Also, as households derived higher monthly incomes, the respondents consumed less *Saba* banana

and sweet potato, which meant that these crops often served as alternative staples among low income earners.

Moreover, the findings imply that all these commodities will be consumed less if their respective prices increase, other things being the same. The opposite signs of price of rice means that as the price of rice increases (or decreases), a greater (or lesser) volume of sweet potato and cassava will be consumed, while the opposite is true in the case of *Saba* banana. This supports the argument that sweet potato and cassava are substitutes to rice; hence, an increase (or decrease) in prices of these crops could trigger significant reduction (or increase) in consumption of rice as well as other commodities including *Saba* banana. On the other hand, *Saba* banana is possibly a good complement to rice, which is consistent with the findings of Lantican, Quillooy, and Sombilla (2011), which indicated that banana is a complement rather than a substitute to rice. *Saba* banana is generally consumed with rice-based meals as indicated by its higher consumption as compared with the root crops considered in this study. Nevertheless, consumers also consider *Saba* banana as a potential substitute to rice if the latter will be unavailable or if there will be a prohibitive increase in its price.

Possibility of Rice Substitution

Close to half of the respondents were willing to substitute the five crops for rice because of their nutritional and health benefits, their ability for filling the stomach, their good taste, and their lower prices compared to rice (Table 4). Nonetheless, substantial proportions ranging from 36 percent (taro) to 40 percent (yam) felt otherwise. Some favored substitution only on certain conditions such as unavailability of rice or prohibitive rice prices.

The consumer-respondents were asked to rank the five crops in terms of their substitutability to rice, with 1 being the highest and 5 the lowest. Among the crops, *Saba* banana had the

Table 4. Substitution possibilities of crops to rice (%), Quezon, 2012

ITEM	SABA BANANA (n=621)	CASSAVA (n=570)	SWEET POTATO (n=602)	TARO (n=557)	YAM (n=506)
Willingness to substitute					
Yes	45	48	46	44	44
No	38	39	38	36	40
It depends	17	13	16	19	16
Reason for willingness to substitute					
Health benefits/ nutritious	25	55	45	32	14
Filling	25	24	26	20	27
Likes the taste	23	10	15	45	37
Low price and others ^a	27	11	14	3	22
Situations where the respondent will substitute					
Unavailability of rice	88	94	78	78	62
High price of rice	12	6	22	22	38

^afor variety of diet and for breakfast only

Source: Pabuayon et al., 2014

highest ranking, averaging approximately 1 followed by sweet potato, which had a mean weighted score of around 2 (Table 5). Yam, which averaged about 5, got the lowest rank.

The consumers were made to select from three types of substitution, which were 1) full, 2) partial with more rice taken with the alternate crop, and 3) partial with less rice taken with the substitute crop. They had five choices of types of meal and these included breakfast, lunch, dinner, morning snacks, and afternoon

Table 5. Consumer ranking of crops as substitute for rice, Quezon, 2012

CROP	WEIGHTED AVERAGE SCORE	NO. OF RESPONDENTS WITH RANK 1 OR 2
<i>Saba</i> banana	1.43 ≈ 1	557
Sweet potato	2.18 ≈ 2	446
Cassava	2.81 ≈ 3	198
Taro	4.01 ≈ 4	21
Yam	4.67 ≈ 5	20

Source: Pabuayon et al., 2014

snacks. While the substitution for the main meal types refers to rice, the substitution during snacks was with respect to other snack items. Appendix 1 indicates that if substitution would be done, a greater number would do so on a partial basis with more rice taken with the alternative crops. Moreover, the substitution would be mainly during the morning and afternoon snacks wherein rice was not being substituted but the other snack items. Among the three main meals, breakfast was the most common time that consumers were willing to substitute the alternate crops for rice fully, particularly for *Saba* banana, sweet potato, and cassava. During rice shortage, particularly during El Niño, substitution of the five crops to rice should be encouraged. The respondents mentioned that they were open to the idea of rice substitution in case rice is unavailable. If consumers get used to the habit of substituting the five crops to rice, this will not only alleviate the problem of rice shortage but also ensure rice sufficiency and lower import costs.

Production Levels of Alternative Crops

The demand for the alternate crops had been established, but is there sufficient supply to meet consumption? Cassava (357 mt) had the highest production followed by *Saba* banana (189 mt), while yam (14 mt) had the least production (Table 6). The average area planted across all crops was small at less than one-third of a hectare. The largest areas were planted for cassava (0.31 ha) and for *Saba* banana (0.32 ha). The smallest areas were planted to yam (0.12 ha) and to taro (0.13 ha). The farmer-respondents' average yields per hectare of each crop were lower than the provincial averages. Mean yield per hectare of *Saba* banana, cassava, sweet potato, taro, and yam farmer-respondents stood at 1.93 mt, 5 mt, 3.8 mt, 2.1 mt, and 0.82 mt, respectively. Meanwhile, provincial averages per hectare were 3.95 mt, 6.73 mt, 5.47 mt, 5.27 mt, and 4.67 mt, respectively. Given the small farm area planted to the five crops and the low productivity, it is not surprising that the total production of the sample respondents comprised only a negligible proportion of the total provincial production.

Farmers claimed that the five crops were planted mainly for home consumption, thereby contributing to food security and providing a source of additional income (Table 7). Only less than 1 percent raised these crops as a rice substitute. Given that the five crops were not grown as main sources of income, it is not surprising that the production, area, and yields were generally low. Moreover, farmers admitted to applying minimal inputs. Even though the volume of production was low, the estimated share of marketed output was quite high ranging from 71 percent for *Saba* banana to 91 percent for cassava and yam (Figure 3). On the average, the disposal shares of all crops were 86 percent for sale, 10 percent for home use, and 4 percent for other purposes (e.g., given away, feeds, and seeds) indicating that a greater proportion of the total produce, though limited, were made available in the market for consumers which seems to negate the farmers' pronouncement that they only plant the five crops for home consumption. The farmer-respondents' claims could be due to the low volume of production; thus sales, which may provide some additional income may not be really substantial to the farmers; hence, to them, the crops are grown for home consumption only.

Table 6. Production, area planted, and average yield per hectare by crop, Quezon, 2012

CROP	PRODUC- TION (mt)	AREA PLANTED TO CROP (ha) Total	Ave/ Farm	% OF CROP AREA TO TOTAL FARM	YIELD (mt/ ha)	PROVINCIAL YIELD (mt/ha)*	TOTAL PROVINCIAL PRODUC- TION (mt)*	% OF RESPONDENTS' PRODUCTION TO PROVINCIAL PRODUCTION
Saba banana	189	97.86	0.31	29	1.93	3.95	24,144	0.78
Cassava	357	69.03	0.32	26	5.0	6.73	38,976	0.92
Sweet potato	147	38.77	0.18	20	3.8	5.47	29,341	0.5
Taro	59	28.06	0.13	10	2.1	5.27	2,728	2.16
Yam	14	16.82	0.12	9	0.82	4.67	117	12

Source: Pabuayon et al., 2014 and Bureau of Agricultural Statistics, 2013

Table 7. Reasons for planting the crop, Quezon, 2012

REASONS FOR PLANTING CROP	%
Home consumption	60.0
Additional income	55.0
Animal feeds	0.8
Inherited	1.2
Rice substitute	0.4
Others	2.2

Note: Multiple responses
Source: Pabuayon et al., 2014

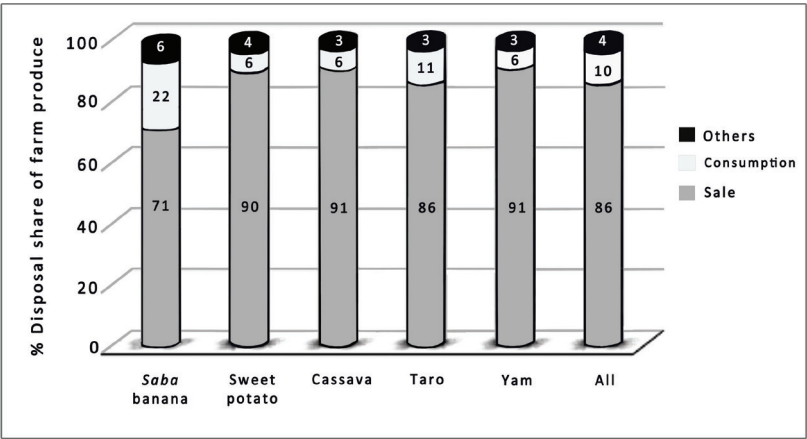


Figure 3. Disposal shares (%) of farm produce, Quezon, 2012
(Pabuayon et al., 2014)

Market Outlets

Farmers sold their produce to different market outlets, majority of whom were traders/*viajeros* who come from different areas (Figure 4). They usually bought whatever volume they could from individual farmers and consolidated these in large volumes for delivery to major market centers. About one-fourth of the farmers brought their produce to the public market where they sold to retailers. They also sold to end-users, mostly households in their respective communities. A very small proportion brought their produce to the trading post in Sariaya, a nearby town, implying that farmers do not necessarily patronize large wholesale markets, probably due to the small volumes for sale. Furthermore, a greater number of the farmer-respondents sold to market outlets that were accessible to them, usually within their villages or other villages within their municipalities (Figure 5). Nevertheless, some farmers sold to outlets from other provinces within Region IV-A, but in a few instances, *Saba* banana, cassava and yam farmers sold to buyers who reside outside Region IV-A. Farmers’ decision to sell to nearer markets may have considered the low volume of sales and additional marketing costs if they went to far areas.

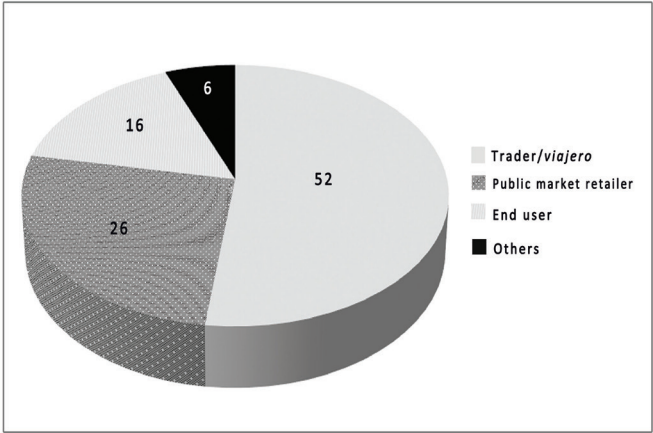


Figure 4. Proportion (%) of farmers selling to market outlets, Quezon, 2012 (Pabuayon et al., 2014)

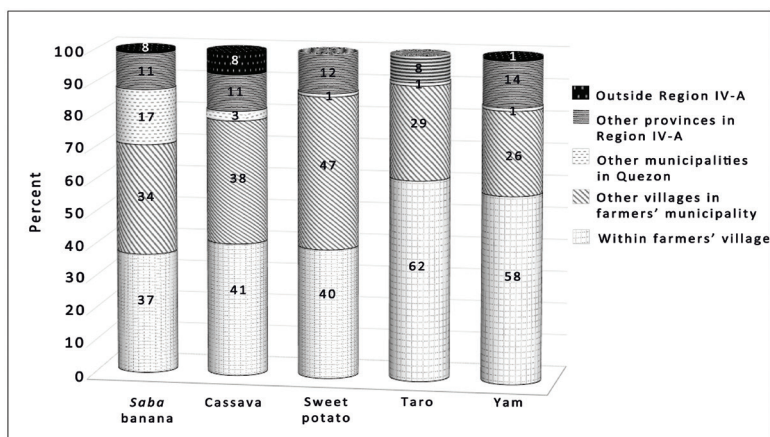


Figure 5. Proportion (%) of farmers selling to specific market locations, Quezon, 2012 (Pabuayon et al., 2014)

CONCLUSIONS

The potentials of *Saba* banana, sweet potato, and cassava are relatively higher as compared with taro and yam. Based on the per capita consumption, *Saba* banana had the highest demand among the five alternate crops, followed by sweet potato then cassava. Furthermore, farmers perceived that *Saba* banana was the most in demand among the alternative crops followed by cassava, while sweet potato ranked third. Traders shared the same opinion that *Saba* banana came first but they considered sweet potato as the second most in demand, while cassava came third. *Saba* banana, sweet potato, and cassava also ranked as the top three in terms of being possible substitutes for rice.

However, consumers still preferred to consume these crops as snack food items rather than full substitutes for rice in the main meals. They were willing to make full substitution largely for breakfast only and relatively much less for other meals. Nevertheless, the potential demand could be increased if substitution could be encouraged. Moreover, rice substitution will help alleviate rice shortage. However, the deficit in *Saba* banana and yam necessitates an increase in local production.

Several factors influenced demand for the alternative crops. The respondents' age positively affected demand for *Saba* banana and sweet potato; monthly household income (negative) for *Saba* banana and sweet potato; and own price (negative) for all crops. Education negatively influenced demand for *Saba* banana, sweet potato and cassava, but positively affected the demand for yam. Price of rice had a positive effect on demand for cassava and sweet potato, but the contrary was true for *Saba* banana.

RECOMMENDATIONS

There is an impending probability of rice shortage in the Philippines because of El Niño and La Niña episodes that historically hit the country. The Philippines' sources of imported rice are not exempted from this worldwide phenomenon; hence, there is no assurance that the supply of rice in the world market would remain stable. Production from countries such as Vietnam and Thailand had dropped; consequently, exports of these countries are expected to decline. These trends will definitely limit the amount of rice that the country imports from these countries. This will eventually lower the buffer stock, and the Philippines may suffer another rice shortage. Moreover, the occurrence of La Niña towards the end of 2016 may aggravate the predicted low rice production level in the Philippines. This is where the substitution particularly of *Saba* banana, sweet potato, and cassava, to rice could be pushed. These crops are more resilient to climate change (i.e., drought) and may provide the necessary food supply in such eventuality. As shown in the results, many of the respondents were willing to substitute *Saba* banana and the four rootcrops to rice albeit on a partial basis or during breakfast most especially at times when rice is unavailable.

Encouraging substitution of the aforementioned crops to rice is best done in provinces or regions where these crops are grown abundantly and/or commercially. Local government units (LGUs) should be motivated to formulate policies and programs, and establish strategies that will stimulate substitution of *Saba* banana, cassava, sweet potato, yam, and taro to rice. However, this

does not prevent other areas where the five crops are not grown commercially from doing the same.

Respondents preferred to consume the five crops as snack foods. Considering that these food items are healthier choices as compared with junk food, which is the usual preference of children, an LGU policy to promote the serving of *Saba* banana, cassava, sweet potato, yam, and taro as snack food in schools could be pursued.

To raise production or farm yields, particularly for commodities with deficits such as *Saba* banana and yam, farm management practices should be improved. Meanwhile, for crops with surpluses such as sweet potato, cassava, and taro, market linkages that will enable them to sell their produce outside of the province and the region should be established.

The bigger challenge to the government is how to encourage consumers to substitute the five crops to rice when there is no rice shortage. Given the eating habits of Filipinos who are primarily biased to rice, particularly in Quezon and nearby Southern Tagalog provinces, this could not be easily done. Hence, information campaign regarding the benefits (e.g., economic) of substituting these crops to rice should be enhanced. In case the eating habits of Filipinos do change, this will ease the country's rice self-sufficiency problem as well as the costs of importation.

Based on the findings, it is recommended that both the supply and demand issues for the selected crops be addressed to maximize their potential for developing the communities in the study areas. On the supply side, production must be increased for deficit crops such as *Saba* banana and yam. Measures may include improving the farm management practices of farmers and availing of technical assistance from municipal and provincial agricultural offices in order to increase farm yields. An entrepreneurial mindset among the farmers is also required to fully explore the business opportunities present in these crops.

On the demand side, strategies are needed to enhance market linkages for surplus crops such as sweet potato, cassava, and taro. This will provide alternative markets that can offer better prices. In order to increase overall demand and take advantage of the nutritional benefits of these crops, substitution of rice, particularly with *Saba* banana, sweet potato, and cassava must be encouraged. However, this will entail implementing effective and innovative promotional and information campaigns focusing on factors that will influence or motivate the consumption of these crops as well as on the economic value and other benefits of these crops.

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APPENDIX

Appendix 1. Type of substitution of Saba banana to rice by meal, Quezon, 2012 (n = 557)

CROP/MEAL	TYPE OF SUBSTITUTION		
	Full	Partial (More Rice)	Partial (Less Rice)
<i>Saba banana</i>			
Breakfast	140	393	21
Lunch	43	503	11
Dinner	55	481	21
Morning snack ^a	465	86	6
Afternoon snack ^a	465	86	6
<i>Sweet potato</i>			
Breakfast	88	333	25
Lunch	29	413	4
Dinner	36	395	15
Morning snack ^a	354	56	30
Afternoon snack ^a	354	56	30
<i>Cassava</i>			
Breakfast	62	95	41
Lunch	21	176	1
Dinner	30	151	17
Morning snack ^a	174	1	23
Afternoon snack ^a	174	1	23
<i>Taro</i>			
Breakfast	6	13	2
Lunch	0	19	2
Dinner	5	12	4
Morning snack ^a	17	0	4
Afternoon snack ^a	17	0	4

Appendix 1. Type of substitution...(Continued)

CROP/MEAL	TYPE OF SUBSTITUTION		
	Full	Partial (More Rice)	Partial (Less Rice)
Yam			
Lunch	3	17	0
Dinner	2	17	1
Morning snack ^a	19	0	1
Afternoon snack ^a	19	0	1

^aWith respect to other snack items

Source: Pabuayon et al., 2014