Working Paper #06

CGIAR | Fruit and Vegetables for Sustainable Healthy Diets

Opportunities and Constraints Influencing the Adoption of High-density and Biodiverse Fruit tree Planting in Guinayangan, Quezon

Del Rio, S., Anunciado, M.S., Monville-Oro, E., Gonsalves, J., Hunter, D., Borelli, T., Mendonce, S.

July, 2023

The CGIAR Research Initiative on Fruit and Vegetables for Sustainable Healthy Diets (FRESH) aims to use an end-to-end approach to increase fruit and vegetable intake and in turn improve diet quality, nutrition and health outcomes while also improving livelihoods, empowering women and youth and mitigating negative environmental impacts.

The FRESH Initiative activities are bundled into six packages, namely:

- Work Package 1: Understanding and Influencing Consumer Behaviour
- Work Package 2: Biodiversity, genetic innovation, and seed systems
- Work Package 3: Safe and sustainable production systems
- Work Package 4: Post-harvest and inclusive markets
- Work Package 5: Food Environments
- Work Package 6: Strengthening the enabling environment.

To learn more about this Initiative, please visit:
Fruit and Vegetables for Sustainable Healthy Diets (FRESH) - CGIAR

Citation:

Del Rio, S., Anunciado, M.S., Monville-Oro, E., Gonsalves, J., Hunter, D., Borelli, T., Mendonce, S. 2023. Opportunities and Constraints Influencing the Adoption of High-density and Biodiverse Fruit tree Planting in Guinayangan, Quezon. Alliance of Bioversity International and CIAT. City, Country. 31 pages.

Cover photo credit: International Institute of Rural Reconstruction (IIRR)

Opportunities and Constraints Influencing the Adoption of High-density and Biodiverse Fruit tree planting in Guinayangan, Quezon

Authors

Susan P. del Rio[1],

Ma. Sheila S. Anunciado[1],

Emilita M. Oro[1],

Julian Gonsalves[1],

Danny Hunter[2],

Teresa Borelli[2],

Sharon Mendonce[2]

Organizations

[1]International Institute of Rural Reconstruction

[2] Bioversity International

Acknowledgements

The authors would like to thank...

Belina Rosales	OMA Guinayangan (MAO)
William Lopez Jr.	OMA Guinayangan
Carlo Palima	OMA Guinayangan
Mico Comia	OMA Guinayangan
Ailyn Deguito	OMA Guinayangan
Ruel Jordan	IIRR Guinayangan Learning Community
Jonalyn Laco	IIRR Guinayangan Learning Community
Rico Locaba	IIRR Guinayangan Learning Community

and the Food Environment and Consumer Behaviour communications team at the Alliance of Bioversity International and CIAT.

Summary

The main purpose of this study was to generate evidence on the factors influencing the adoption of diversified fruit tree systems and to assess rural consumers' views and preferences for local fruits in Guinayangan, Quezon. The Municipality of Guinayangan in Quezon Province was used as the study site because of prior work undertaken by the International Institute of Rural Reconstruction (IIRR), in partnership with the Local Government Unit (LGU), specifically the Municipal Agriculture Office, to promote fruit trees.

This paper presents the result of a study conducted among fruit growers and consumers. To determine the potential for promoting biodiverse fruit tree systems and to determine which fruits are most suitable for the region and likely to be profitable, a survey was conducted among producers and consumers in the study area.

Fruit production is viewed as a profitable income generating livelihood and a viable strategy to promote climate smart agriculture and agrobiodiverse systems. Fruit tree growing is normally a secondary source of income in Guinayangan after coconut farming. Fruit trees are intercropped with coconut trees, allowing farmers to increase their overall yield by intensifying land use. A focus on fruit trees can help create economic spaces for women in coconut farming systems that are primarily male dominated. Furthermore, diversified fruit tree systems can help conserve agrobiodiversity while serving as a climate change adaptation mechanism. Biodiverse and high-density fruit tree systems are an important way to enhance the nutrition contributions of agriculture, thus serving as a form of nutrition sensitive agriculture.

Keywords

Agrobiodiversity, fruit trees, fruit production, intercropping, rural livelihoods, nutrition-sensitive agriculture, climate change adaptation.

Contents

Acknowledgements 4
Summary 5
Keywords 5
1. Introduction 9
2. Methodology 10
2.1 Site selection 10
2.2 Data gathering 12
2.3 Survey 13
2.4 Study limitations 13
3. Results and Discussion 14
3.1 Factors influencing the adoption of biodiverse fruits 14
3.2 Constraints and uncertainties 15
3.3 Opportunities for the production of diverse fruit tree orchards 16
3.4 Impact on household consumption 16
3.5 Consumer preferences for local fruits 16
3.6 Opportunities in the town of Guinayangan (Growers and market linkages) 19
4. Conclusion 19
5. Recommendations 21
6. References 23
Annexes 24
Annex A 24
Annex B 25

Tables

Table 1: Profile of the study sites. 12
Table 2: Number of participants in the focus group discussion 12

Figures

Figure 1: Location map of the study sites. 11
Figure 2: Focus group discussion spokesperson presenting group answers. 13
Figure 3: Focus group discussion among fruit growers. 14
Figure 4: Factors influencing the Guinayangan fruit growers to adopt biodiverse fruits. 15
Figure 5: Factors hindering the Guinayangan fruit growers from adopting biodiverse fruits. 16
Figure 6: Consumer interest in buying local fruits. 17
Figure 7: Frequency and preparations of fruits consumed 18
Figure 8: Preferences of consumers in buying fruits. 19

Photo by: Danny Hunter/ Bioversity International

CGIAR

Fruit and Vegetables
for Sustainable
Healthy Diets

1. Introduction

Low fruit and vegetable consumption contributes to poor food diversity and diets, raising the prevalence of non-communicable diseases and malnutrition. Accessibility, cost, availability, and desirability are major obstacles to increasing intake. This recognizes the complexity of food systems and the need for coordinated change in many food system components to reform diets.

The chain comprising the production, distribution, and marketing of tropical fruits has grown significantly in recent years and on a global scale (Bhat and Paliyath, 2016). The major fruits grown in the Philippines are banana, pineapple, mango, papaya, and calamondin or Philippine lime (*Citrus* × *microcarpa*) (Rodeo AJ, 2016). While there are large commercial orchards, most fruit trees in the Philippines are grown in backyards or homesteads. Unlike the monocropping practiced in orchards/plantations, backyard fruit production combines the growing of fruit trees in combination with other crops.

The IIRR in the Philippines is contributing to Work Package 2 of FRESH, which focuses on biodiversity conservation, seed systems, and genetic innovation issues. The study is establishing country-specific evidence to understand the factors influencing growers' adoption of diverse fruit tree systems. The study also assesses consumer preferences and accessibility to fruits in rural areas.

The Department of Agriculture (DA), Department of Science and Technology (DOST), and other organizations like the Bureau of Agricultural Research (BAR), High-Value Commercial Crops Development Program (DA-HVCDP), and Philippines Council for Agriculture, Aquatic and Resources Research and Development (PCAARRD) oversee coordinating the promotion, research, and development for fruit crops in the Philippines.

Fruit production is a profitable and viable strategy for increasing the income of upland farmers. In the Philippines, fruit trees are frequently incorporated into the current coconut tree based cropping systems as part of existing food production and environmental protection projects. This study focused on prior work undertaken by the International Institute of Rural Reconstruction (IIRR) and the Local Government Unit (LGU) in Guinayangan, Quezon, involving the distribution of fruit trees and documentation of resilience outcomes at household levels. Recommendations will be made for establishing programs and interventions to promote the accessibility and availability of local fruits in rural settings of relevance to smallholders and tenant farmers with rights to use spaces between coconut trees.

The objectives of the study were to:

1. To determine the driving forces, factors, and support services influencing the adoption of diverse and intensive fruit tree systems among men and women producers; and
2. To assess consumer perceptions and preferences for local fruits in Guinayangan, Quezon.

2. Methodology

2.1 Site selection

The study was carried out in Guinayangan (Figure 1), a third-class municipality in Quezon Province with an annual average income of Php 35 to 45 million (about 625–800k USD). The Guinayangan local government and IIRR have been working together to empower the local rural population economically. Guinayangan consists of 54 Barangays (smallest political unit in the country) and 79% of its agricultural land is dedicated to coconut farming. The most popular agricultural products are coconut and its by-products.

For Objective 1, which is to determine the driving forces and support services influencing the adoption of diverse fruit tree systems, three Barangays were chosen for the study and interviews, based on the following criteria: (1) recipient of the fruit tree distribution program by the IIRR (2) group of mainly women fruit growers; (3) cultivated trees at least in their home gardens. Barangay Calimpak was the study site for the consumer surveying area because it was where the local public market is located. The parameters for the site selection included (1) accessibility and (2) distance to the market. (See Table 1)

Figure 1: Location map of the study sites.

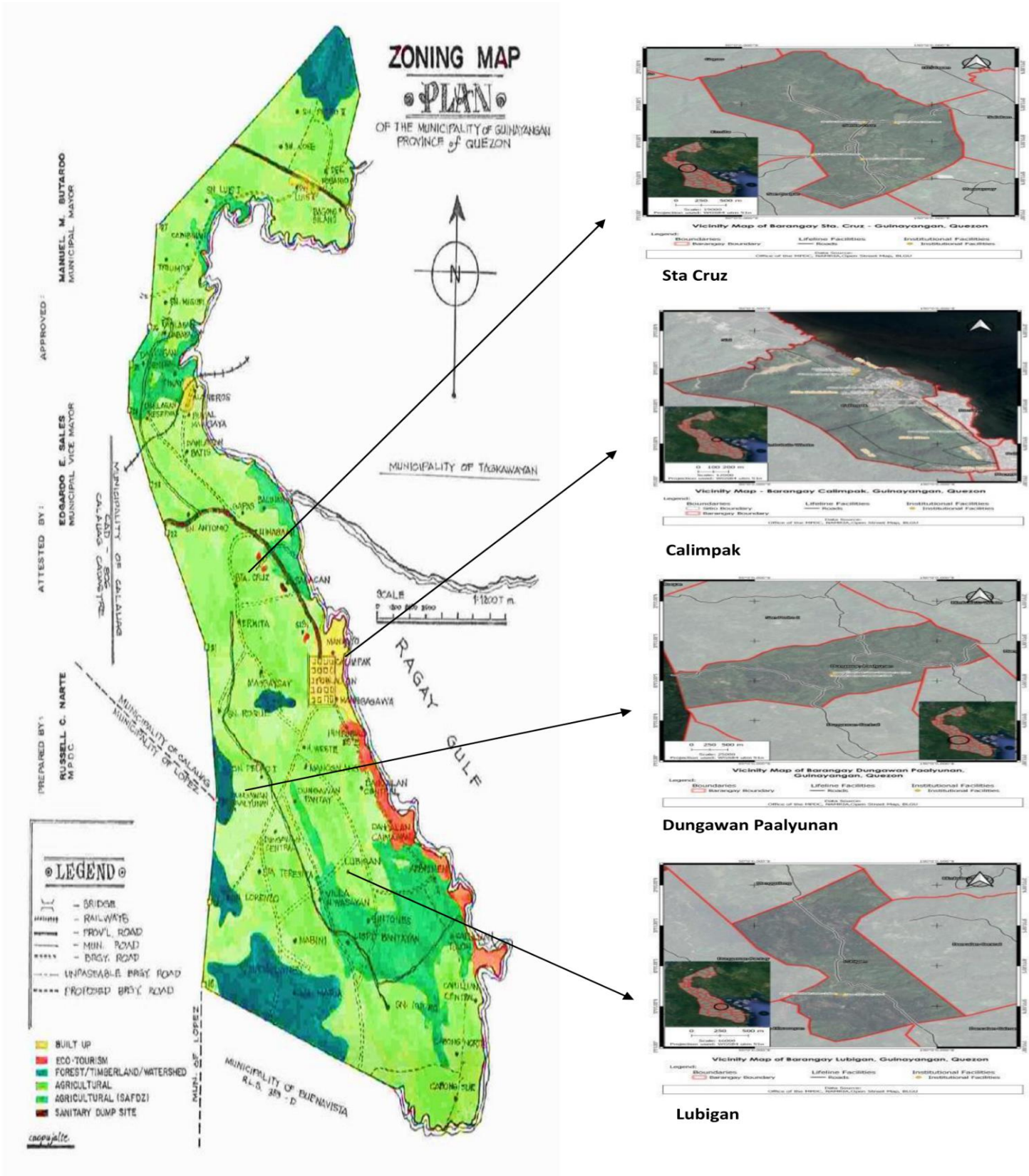


Table 1: Profile of the study sites.

Barangay	No. of households	Livelihood resources	Major Crops	Geographic characteristics	Cemented Road
Calimpak	1400	Fishing, copra and business	Copra and rice	Coastal and lowland	95%
Dungawan Paalyunan	266	Coconut farming, vegetables and Banana farming, cacao farming	Coconut, vegetables, banana	Upland	45%
Lubigan	147	Coconut farming, broomstick, habal-habal (transportation)	Coconut, Banana, vegetables	Lowland and Upland	40%
Sta Cruz	236	Coconut farming, Rice farming, Hog raising	Coconut, Rice, Vegetables	Upland	60%

2.2 Data gathering

To learn more about the facilitating factors and support services influencing the adoption of biodiverse fruit-tree systems of the fruit growers, focus group discussions (FGD) were conducted. A total of 120 fruit growers attended the FGD (27 from Dungawan Paalyunan, 32 from Lubigan, and 61 from Sta Cruz). Fruit growers were divided into three groups, and a distinct set of questions provided to each group (Table 2). Each group was provided with pens, meta cards, and paper. FGD representatives were nominated to present discussion outputs to the wider group. The primary facilitator collected additional information from the other participants (See Annex A. for FGD questions).

Table 2: Number of participants in the focus group discussion.

Barangay	No. of Participants (Women)	No. of Participants (Men)	Total Participants
Dungawan Paalyunan	16	11	27
Lubigan	25	7	32
Sta Cruz	39	22	61

Figure 2: Focus group discussion spokesperson presenting group answers.

Source: IIRR

2.3 Survey

Pen-and-paper personal interviews were conducted to assess consumer preferences for fruits. A structured questionnaire was used (see Annex B). The 180 consumer respondents were randomly selected during the intercept survey related to sociodemographic characteristics (gender and age). Aside from the personal interview, one FGD in the public market was held during the market day. The survey questionnaire was provided and includes questions covering aspects such as demographic profile and consumer preferences relevant to purchasing behavior. Questions relevant to purchasing behavior include liking, sources of purchase, and consumption patterns.

2.4 Study limitations

The study was conducted to determine the driving forces, factors, and support services influencing the adoption of biodiverse fruit trees and to assess consumer perceptions and preferences for local fruits in Guinayangan, Quezon. Due to time and financial limitations, only three Barangays were included for the fruit growers. Only one Barangay was covered in the consumer survey.

Figure 3: Focus group discussion among fruit growers.

Source: IIRR

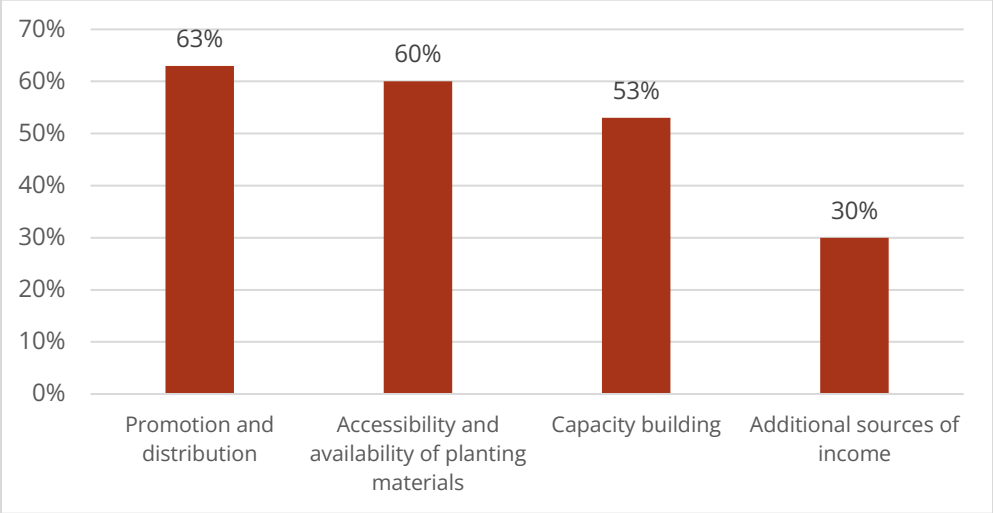
3. Results and Discussion

3.1 Factors influencing the adoption of biodiverse fruits

The initiative of the IIRR to promote and distribute fruit trees, through support of the LGU's municipal agriculture office, is the main factor influencing the adoption of biodiverse fruit production in the municipality (Figure 4). IIRR and the Department of Agriculture through the LGU, delivered to beneficiaries avocado (*Persea americana*), banana (*Musa* spp.), calamondin (*Citrus x macrocarpa*), cashew (*Anacardium occidentale*), durian (*Durio zibethinus*), guava (*Psidium guajava*), jackfruit (*Artocarpus heterophyllus*), langsat (*Lansium domesticum*), mangosteen (*Garcinia mangostana*), pili nuts (*Canarium ovatum*), pomelo (*Citrus maxima*), soursop (*Annona muricata*) and rambutan (*Nephelium lappaceum*).

Aside from the initiatives of IIRR, LGU provided farmers with agricultural inputs such as fertilizers, and capacity-building activities through seminars and technical mentoring on fruit tree production. The LGU also encouraged farmers to apply for crop insurance under the Philippine Crop Insurance Corporation (PCIC), a government-owned and controlled corporation created as the implementing agency of the government's agricultural insurance program, to help protect them against declines in crop yields and revenue.

Figure 4: Factors influencing the Guinayangan fruit growers to adopt biodiverse fruits.



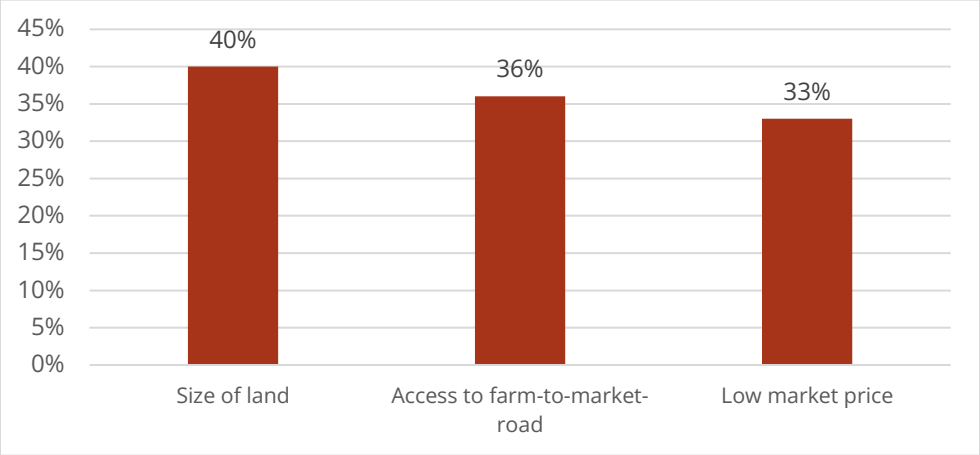
3.2 Constraints and uncertainties

Fruit growers identify farm size as the main factor influencing their decision to plant other trees on their land (Figure 5). Coconut, as the main cash crop, is given priority on any farm that is less than half an acre. This is because, according to a limited number of farmers, the harvesting of coconut fruits is affected when too many fruit trees are intercropped with coconut.

Growers often face challenges in selling their products in markets. One of the primary reasons for this challenge is the limited farm-to-market roads and poor transportation facilities. This makes it difficult for growers to transport their products to the markets in a timely and cost-effective manner. In many cases, the roads are unpaved, making it difficult for vehicles to pass through. This causes delays in the transportation of goods and increases the risk of damage to the products. In Brgy. Dungawan Paalyunan, only 45% of the roads are paved, in Lubigan, 40% of the roads are paved, and in Sta. Cruz, 60% of the roads are concrete (Table 1). This indicates that there is a significant need for better infrastructure in these areas to facilitate the transportation of goods.

Fruit growers face uncertainties when it comes to marketing their harvests. Among the most significant challenges are the costs of delivering their produce to market and the uncertainties associated with pricing when supplies are abundant. The fruit market is subject to fluctuating supply and demand and transportation challenges. These factors can contribute to high delivery costs and price uncertainties. When supplies are abundant, for example, prices tend to drop due to oversupply. This can result in lower profits for growers, who may also face higher delivery costs.

Figure 5: Factors hindering the Guinayangan fruit growers from adopting biodiverse fruits.



3.3 Opportunities for the production of diverse fruit tree orchards

Farmers incorporate fruit trees into their farming or homestead systems in various ways: planting fruit trees in their backyard gardens, along upland and lowland field boundaries as windbreaks, and as an intercrop in coconut tree plantations. The fruit growers report that trees provide extra shade and help filter the air, creating a microclimate in the area, as well as creating a habitat for bees, birds, and butterflies.

Socio-psychological benefits of growing fruit trees were often highlighted in group efforts -the building of camaraderie, especially among the women members of the fruit grower association. Women work with fruit tree ventures, doing farm operations like fertilizer application, cleaning, and sanitation. Their husbands work on coconut crop operations such as preparation of copra (processed, dried coconut meat). Women fruit growers can earn additional income from fruit tree intercrops because of their involvement in the sale of harvested fruits.

3.4 Impact on household consumption

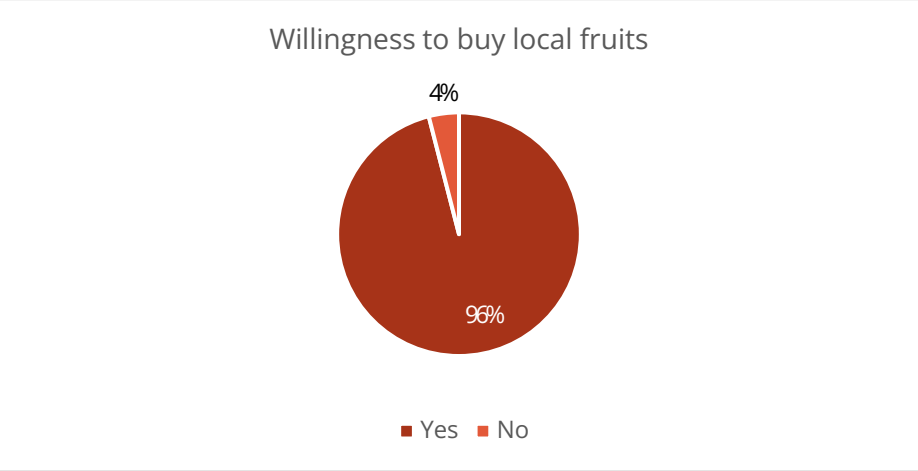
Ninety (90%) of the harvested fruit is used for home consumption thus benefiting nutrition and food systems. The surplus is sold within the Barangay. However, fruit growers reported not eating enough fruits because the planted fruit trees have yet to reach the fruit bearing stage. Bananas are the main fruit consumed.

3.5 Consumer preferences for local fruits

Ninety-six percent (96%) of consumers expressed interest in buying local/indigenous fruits if available in the market (Figure 6). Preferred local fruits include banana, star apple, sapodilla, dragon fruit, soursop, jackfruit, langsat, water apple (macopa), mango, mangosteen, papaya,

pineapple, pomelo, rambutan, Spanish plums (sineguelas). The supply of these fruits therefore needs to be enhanced. Respondents indicated they would not buy kerson fruit (aratiles), custard apple, guava, tamarind and cotton fruit (santol) because they already have access to those fruits in the wild. There appears to be low interest for consumption and purchase of durian because of the smell and the taste.

Figure 6: Consumer interest in buying local fruits.

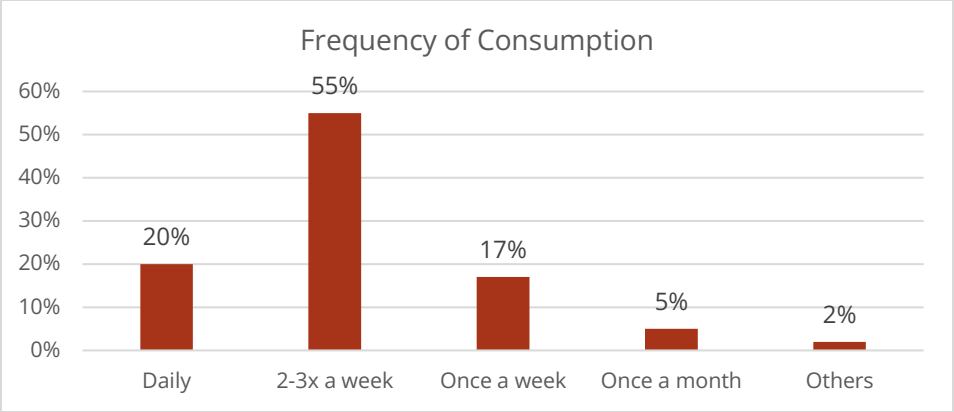


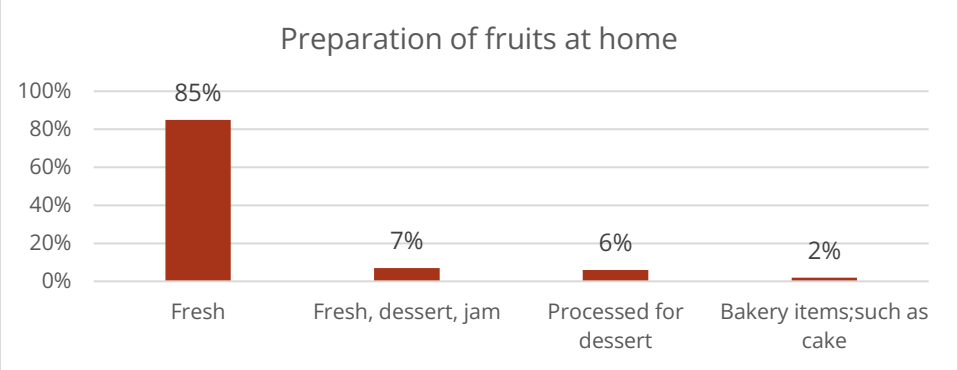
Fifty-eight percent (58%) of consumers in Calimpak consume fruits 2-3 times a week, 21% reported daily consumption, 18% reported use once a week, and 3% once a month. The study indicates that rural consumers do buy fruits in the local public market, and more than half of the respondents consume fruits an average of 2-3 times a week. Banana is the most consumed fruit, since it is readily available, and accessible. Consumers report eating the fruit immediately after purchase and prefer to consume them fresh rather than processed (See Figure 7).

The top five fruits bought in the market are apples, grapes, oranges, bananas, and mangoes. The consumer's main source of fruits is the market. A total of 49% of the rural consumer respondents indicated preference of imported fruits over local fruits because their children preferred to eat those fruits. The second reason is that their neighbors and relatives give them local fruits (i.e., what is readily available and in excess supply).

The survey highlighted that price is an important factor influencing the buying behavior of fruits. When the consumers were asked why they do not consume enough fruits, 88% of the respondents answered that they do not have enough funds to buy fruits. Other factors affecting consumer preference in fruits are freshness, taste and flavor (Figure 8).

Figure 7: Frequency and preparations of fruits consumed.





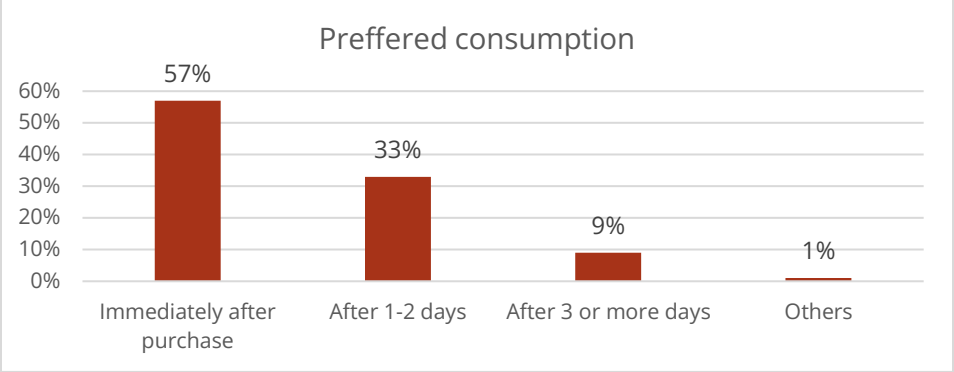
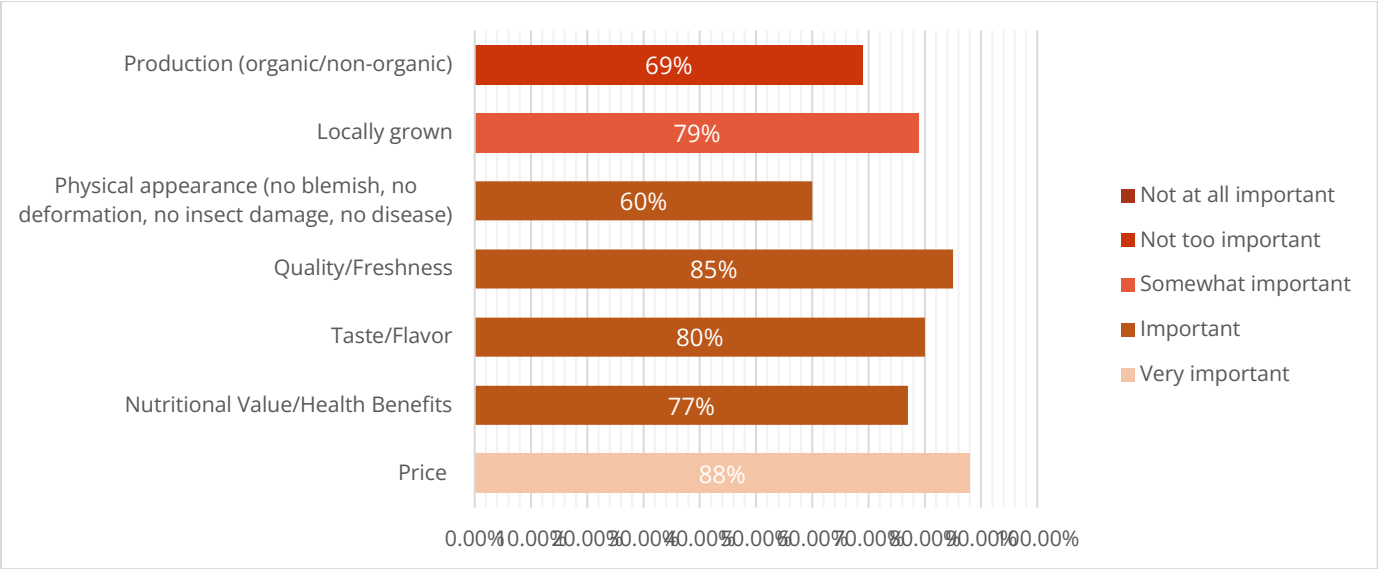


Figure 8: Preferences of consumers in buying fruits.



3.6 Opportunities in the town of Guinayangan (Growers and market linkages)

Fruit growers produce fruits for consumption and as a source of income. Small growers in Guinayangan have planted a wide range of fruit trees, including rambutan, mangosteen, calamondin (Philippine lime) banana, avocado, soursop, durian, langsat, jackfruit, pomelo, pili nuts, papaya, and cashew (promoted and distributed by IIRR), cranberry, custard apple, longan mulberry, lemon, guava, kerson fruit, wild cherry , starfruit, cotton fruit, and water apple. The town of Guinayangan is suitable for producing a diverse range of fruits and has good potential for producing local fruits. At present, the fruits that were planted from the IIRR distribution have not started to bear fruits.

Consumers are one of the major market players (Bekele et al. 2016). Based on the consumer survey, consumers who live in the Poblacion (town or administrative centers) are interested in buying local fruits when available. The majority of consumers living in Calimpak (one of the areas in Metro Poblacion with the highest population) have no space for planting their own fruit. Most fruits consumed are bought in the public market.

4. Conclusion

Growing fruits can provide a variety of advantages and benefits to improve diets, nutrition and health. Foremost, farmers can have a more direct relationship with consumers. This allows them to better tailor their production to meet the needs and preferences of consumers, resulting in increased sales and profits. Direct-to-consumer sales can help reduce farm costs by eliminating the need for middlemen and reducing marketing expenses. By selling fruits directly to consumers, farmers can ensure that their produce remains fresh for a longer period, which in turn can provide higher levels of nutrients and vitamins. Furthermore, by

growing fruits locally and prioritizing local markets, farmers can reduce the need for long-distance distribution, ensuring fresher produce.

Fruit tree growing is currently a secondary source of income in Guinayangan. It is considered a relatively long-term investment that can supplement household income from coconut farming, which is the primary source of revenue. Fruit trees are intercropped with coconut trees, allowing farmers to increase their overall yield by intensifying land use. However, farmers have noted that it can be challenging to pick coconut fruits when fruit trees are intercropped. To address these challenges, farmers in Guinayangan should develop strategies to maximize the benefits of intercropping while minimizing the risks. Fruit trees have a slower growth rate, which can reduce the competition with coconut trees. One approach is to plant low growing trees, such as mango, avocado, and banana, so that the branches don't obstruct coconut harvesting. Farmers should also practice proper soil and nutrient management, such as applying fertilizers, green leaf manure and compost to ensure that the fruit trees do not deplete the soil of essential nutrients. Furthermore, farmers can use pruning techniques to reduce branching and maintain a healthy balance between the fruit trees and the coconuts.

Customers choose to buy these five preferred fruits: apples, grapes, oranges, bananas, and mangoes. Due to the children's preference and availability of the fruits, consumers choose to buy certain fruits. Parents and teachers should try to model healthy eating habits. Children are often more likely to eat fruits and vegetables if their parents are seen to enjoy them. By making local fruits part of daily diets, parents can set an example for their children and show that local fruits can be just as delicious as imported ones. Secondly, parents and teachers should seek out opportunities to introduce local fruits to their children. Teachers could also encourage their students to try out school lunch programs that offer locally sourced fruits.

Reversing the current preferences of children for imported fruits can be achieved through a combination of education and marketing. The first step would be to educate children on the benefits of eating locally sourced produce. Children should be made aware that locally sourced fruits are usually fresher, safer and nutritious. Another way to reverse the interest and dependency of children on imported fruits is to make locally sourced produce more available and accessible. This can be accomplished by making sure that local farmers have a presence at farmer’s markets or other outlets, or by arranging for school cafeterias and other institutions to use locally sourced produce. It might be helpful to provide youth with hands-on experience and exposure to local farms so that they can learn more about where their food comes from. Finally, it will be important to make locally sourced produce more appealing to children by emphasizing its freshness, taste, and convenience. This can be done by providing recipes and other ideas for using locally sourced produce, or by making it more fun to purchase and prepare locally sourced produce. This could include fun activities, such as organoleptic tests or fruit picking, as well as promotional materials such as posters, leaflets, and banners. By combining education and marketing, we can help reverse the interest of children in imported fruits, while also supporting the local economy.

5. Recommendations

Results of the study showed a strong market potential for local fruits in Guinayangan, as 96% of the consumer respondents expressed their interest in buying local fruits if made available in market outlets. A thorough analysis of customer preferences for fruits provides opportunities and information on the viability of growers' efforts to produce fruit. The consumer study suggests a solid basis for the prioritization of fruits for promotion and distribution with respect to crop suitability. Among those local fruits are banana (*Musa spp*.), star apple(*Chrysophyllum cainito*), sapodilla (*Manilkara zapota*), dragon fruit *(Hylocereus undatus*), soursop (*Annona muricata*), jackfruit (*Artocarpus heterophyllus*), langsat (*Lansium domesiticum*), water apple (*Syzygium samarangense*), mango (*Mangifera indica*), mangosteen (*Garcinia mangostana*), papaya (*Carica papaya*), pineapple (*Ananas comosus*), pomelo (*Citrus maxima*), rambutan (*Nephelium lappaceum*), and Spanish plums (*Spondias purpurea*).

Furthermore, the adoption of fruit tree growing by farmers and increased consumption of local fruits can be improved with the following:

Technical capacity to improve fruit tree production and propagation practices of farmers

In order to support fruit tree production, it is crucial to have technical expertise in various aspects of tree management. This includes proper care and maintenance of the trees, as well as knowledge of propagation techniques such as grafting. Without the technical know-how, it can be difficult to ensure the health and productivity of fruit trees, which can ultimately impact the success of the entire fruit production operation. Proper management practices and propagation techniques can help to ensure that fruit trees are healthy and productive, which can lead to increased yields and profitability for the grower. Training farmers on seed-saving and propagation techniques will make it easier to generate and share their own planting materials.

Establishment of semi-commercial fruit nursery and field gene banks

Establishing a local fruit nursery is an important step for growers to ensure a reliable source of seedlings for their crop production. Local nurseries provide several benefits to the community including cost savings, improved seedling quality and the ability to customize the seedlings to local conditions. The cost savings associated with establishing a local fruit nursery can be significant. By growing their own seedlings growers can avoid the transportation costs associated with buying seedlings from external suppliers. Additionally, locally grown seedlings may be less expensive due to the decrease in shipping and handling costs. Local nurseries also allow growers to select high-quality seedlings that have been locally adapted. This can help to reduce the risk of introducing new diseases or pests to the area and ensure that the seedlings are better adapted to the local climate and soil conditions. Further, the nursery can be used to customize the seedlings to the growers' specific needs, such as selecting for disease resistance, pest resistance, and fruit quality. Finally, establishing a local

fruit nursery can create job opportunities and economic development within local communities, stimulating the local economy.

A long-term solution to enhance the availability and dissemination of planting materials is to invest in a field gene banks and plant nurseries. Community gene banks can preserve, and distribute a variety of plant and crop seeds, at the same time the community can establish plant nurseries that propagate and distribute plants to the public. By increasing access to these genetic resources, more people, organizations, and communities can obtain the seeds and plants they need to cultivate and grow more sustainable crops.

Improvement of road infrastructure

Road infrastructure development makes it easier for farmers to transport their produce to market, which in turn leads to higher margins for their goods. By reducing the distance and time it takes to get the produce to a market, transportation costs are lowered, and farmers can increase their profits. Additionally, road infrastructure development can reduce the risk of crop loss due to inclement weather, as farmers are able to quickly get their goods to a buyer before their crops are damaged. Farm-to-market roads can also provide other benefits to farmers, such as an increased access to inputs, like fertilizer and pesticides, as well as better access to advice and technical assistance. Furthermore, roads can help reduce food waste, as produce that is damaged or otherwise unsuitable for sale can quickly be transported to a processing plant for other use such as fruit chips, fruit jams. Finally, with better access to markets, farmers can diversify their products and expand their businesses.

Nutrition education programs

Nutrition education is essential for promoting the optimal consumption of fruits. Nutrition education programs provide parents and children with the knowledge and skills needed to make healthy dietary choices. This includes understanding the nutritional value of different fruits, how to select and store them, and how to prepare them in a healthy and appealing way. Nutrition education also emphasizes the importance of eating a variety of fruits as part of a balanced diet. Nutrition education should also be linked to the availability, conservation, accessibility, and utilization of biodiverse fruits. It is important to provide parents and children with access to a wide range of fruit, so they can select nutritious and varied options.

6. References

Bekele, M., Feyisa, K., & Getu, S. (2016). Challenges and Opportunities of Marketing Fruit and Vegetables at Logia, Northeastern Ethiopia. The Case of Onion, Tomato and Banana. *Journal of Marketing and Consumer Research, 22,*51-58.

Bhat, R., & Paliyath, G. (2016). Fruits of Tropical Climates: Dietary Importance and Health Benefits. *Encyclopedia of Food and Health,*138-143. https://doi.org/10.1016/B978-0-12-384947-2.00337-8

Rodeo, AJ. (2016). *The Philippine Fruit Industry: An Overview* [Paper presentation]. International Training Workshop on Cultivation Techniques for Fruit Trees, Jiangxi Academy of Agricultural Sciences, Nanchang, Jiangxi, P.R. China.

Annexes

Annex A

Focus Group Discussion Questionnaire

To determine the driving forces, factors, and support services influencing the adoption of biodiverse fruit tree systems among men and women producers in the Guinayangan, Quezon

1.What is your purpose of cultivating fruit trees?
2.Are you a recipient of IIRR's fruit tree distribution?
3.Name the fruit trees you received?
4.What other fruit trees planted in the area that the IIRR didn't provide?
5.If you are planting other fruits (not from IIRR) where did you get the seedlings?
6.Name the trees which already fruit bearing

What are the key drivers, opportunities, and constraints influencing the adoption of biodiverse fruit?

7.What is the most important thing the orchard does for your community?
8.Do you believe that cultivating fruit crops is more profitable in 10 years? Why?
9. What are your reasons for not investing in planting more biodiverse fruit trees?
10.How much do you usually earn from fruits when they are intercropped from coconuts?
11.How much do you usually earn from fruits when it is mixed with coffee and cacao?
12.What are you doing with the fruit harvest?
13.Where did you sell your harvest?
14.How much or how many are allocated for sale? For home consumption?
15.Aside from the fruits that you are cultivating, what other fruits are you buying? Name the fruits you regularly consume
16.What other problems did you encounter in cultivating fruits?
17.What problems do you encounter in marketing?

What are grower perceptions of the contributions of fruit trees to household level nutrition, livelihoods improvement and ecosystem resilience

18.Do you think that your family is eating enough fruits? Why or Why not?
19.Do you think that cultivating fruit trees creates a livelihood for your family?
20.Has the orchard provided opportunities to engage with the community?
21.What other benefits did you observe in your orchard in terms of bee, bird, and butterfly biodiversity?
22.What microclimate have you observed in your farm from the benefits of mixed and multi-storey cropping of trees?

What barriers and opportunities exist for women to participate in the fruit value chains?

23.Does anyone else in your household participate in cultivating fruit trees?
25.Who decide for the farm operation?
26.What are the roles that women played in fruit cultivation?

Annex B

Survey Questionnaire

Sociodemographic characteristics

Age: 20-30 31-40 41-50 51-60 61-70 70 Above

Gender: male female

Address: _____

Households' composition

Age	No. of Male	No. of Female
0 – 5 years		
6 – 14 years		
15 – 59 years		
60 years and older		

Buying Behavior of Consumers for Fruits

The level of liking for fruits (scale 1-10) 10 is the highest

_____

Where do you get your supply of fruits (multiple answers allowed)

Purchase in the public market

Grow in your own garden

Neighbor

Relatives

Other sources:

Have you ever purchased fruits directly from a local farmer?

Yes

No

What percentage of your food budget do you spend on fruits?

0

Less than 30%

31- 50%

51 to 75%

More than 75%

Who in your household makes the buying decision?

Husband

Wife

Grandparent

Children

Others

What fruits do you regularly buy? Why?

_____

_____

_____

Preferred origin of fruits (multiple answers allowed)

Wild/indigenous

Locally grown

Imported from other countries

No preference

What do you consider on buying fruits (ranking)

__Quality/freshness

__Price

__Organic Products

__Nutritional value

__Source

Do you feel that you eat enough fruits?

Yes

No

If no, what is the reason why you do not eat enough fruits?

Do not have enough budget to buy fruits

Do not like eating fruits

The fruits we like are not available in the market

Others _____

Do you have a hard time stretching your food budget at home?

Yes

No

Sometimes

Factors that influence buying behavior

When buying fruits from the market, how important are the following

Factors that influence buying behavior	Not at all important	Not too important	Somewhat important	Important	Very Important
	1	2	3	4	5
Price					
Nutritional Value/Health Benefits					
Taste/Flavor					
Quality/Freshness					
Physical appearance (no blemish, no deformation, no insect damage, no disease)					
Locally grown					
Imported					
Production (organic/non-organic)					

Consuming Patterns and Preference

How often do members of your household consume fruits?

Daily

2-3x a week

Once a week

Once a month

Never

No answer

Others _____

Preferred time of consumption

- Immediately after purchase
- After 1–2 days
- After 3 or more days
- Other: _____

Preparation of fruits at home (multiple answers were allowed)

- Plain
- Processed for dessert
- Bakery items, such as cake
- Jam
- Others

Perception of Local Fruits

If growing fruits at the backyard, name 3 fruits that are planted

_____

_____

What do you prefer to buy local or imported fruits?

- Local
- Imported fruits
- Both

Would you choose to buy traditional/local fruits over other imported fruits if they are always available in the market?

- Yes
- No

Please let me know if you know them or not, if you've eaten them before or not, and if you would buy them if they are available in the market.

Name of Fruits	I am familiar with the fruit	I have eaten this fruit	I will buy this fruit is available on the market	Remarks Note
Aratilis	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No 3. Maybe	
Atis	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No 3. Maybe	
Bayabas	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No 3. Maybe	
Caimito	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No 3. Maybe	
Chico	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No 3. Maybe	
Dragon Fruit	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No 3. Maybe	
Durian	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No 3. Maybe	
Guyabano	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No 3. Maybe	
Langka	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No 3. Maybe	
Lanzones	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No 3. Maybe	
Makopa	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No 3. Maybe	
Manga	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No 3. Maybe	
Mangosteen	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No 3. Maybe	
Papaya	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No 3. Maybe	
Pinya	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No 3. Maybe	
Pomelo	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No 3. Maybe	
Rambutan	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No 3. Maybe	
Saging	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No 3. Maybe	
Sampaloc	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No 3. Maybe	
Santol	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No 3. Maybe	
Siniguelas	1. Yes 2. No	1. Yes 2. No	1. Yes 2. No 3. Maybe	

This research is being implemented by CGIAR researchers from IFPRI, CIMMYT, The Alliance of Bioversity International and CIAT, IWMI, and CIP in close partnership with World Vegetable Center, Applied Horticultural Research, the University of Sydney, the Institute of Development Studies, Wageningen University & Research, and the University of California, Davis.

We would like to thank all funders who support this research through their contributions to the CGIAR Trust Fund: www.cgiar.org/funders

Alliance of Bioversity International and CIAT
Alliance Headquarters | Via di San Domenico, 1, 00153 Rome, Italy

https://alliancebioversityciat.org/