



Working Paper #04



Fruit and Vegetables
for Sustainable
Healthy Diets

Schools as a platform for promotion and scaling of agrobiodiversity conservation for better nutrition

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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](#)

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Schools as platform for promotion and scaling of agrobiodiversity conservation for better nutrition

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Summary

Agrobiodiversity conservation is an important aspect of sustainable agriculture and food and nutrition security; and schools can play a major role in promoting agrobiodiversity conservation among students and the wider community. The International Institute of Rural Reconstruction in collaboration with the Department of Science and Technology – Food and Nutrition Research Institute and, the Department of Education developed the Integrated School Nutrition Model in the Philippines with support from Canada’s International Development Research Center in 2016. This involved the establishment of a network of Lighthouse Schools and school-based Crop Museums (which are located within the network of LSs).

The Crop Museums serve as seed banks fostering the multiplication and exchange of crop types and varieties across schools. The LSs serve as action research sites of the ISNM program where the integration of school feeding, nutrition education and school gardens are demonstrated, and evidence is established. Both have proven to be crucial in the promotion of agrobiodiversity conservation within schools and the wider local community. This study analyzes this network of Lighthouse Schools and Crop Museums, with the aim of understanding their role in the conservation of traditional and indigenous fruits and vegetables in the Philippines, and to identify further opportunities to scale up and scale out their work.

Keywords

Traditional and Indigenous Fruits and Vegetables, genetic resources conservation, seed bank, school nutrition, school feeding.

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Photo by: IIRR



INITIATIVE ON
Fruits and Vegetables

1. Introduction

Schools play a vital role in providing youth with the knowledge and skills they need to make informed decisions about their health and the environment. Schools can educate students about the importance of balanced diets and the role of different food groups in maintaining balanced diets. This can help the younger generation develop healthy eating habits with lifelong benefits.

In the Philippines, the mean per capita consumption of fruits and vegetables is only 37 and 123 grams (g), respectively. It is less than 50% of the World Health Organization (WHO) recommended fruit and vegetable intake of at least 400 g or five servings of fruit and vegetables per day. This is considered inadequate in terms of macronutrients and micronutrients even according to the Expanded National Nutrition Survey 2015.

The importance of fruits and vegetables for balanced diets to prevent malnutrition and to reduce the risk of diseases, while conferring other benefits is well researched (FAO, 2020). Indigenous fruits and vegetables can make such diets more accessible to a variety of communities and could play a major role in fostering more diversified and sustainable food production systems (Ebert, 2014).

Indigenous vegetables are defined as “species that are locally important for the sustainability of economies, human nutrition and health, and social systems but which have yet to attain global recognition to the same extent as major vegetable commodities” (Keatinge et al., 2014). In the Philippines, traditional and indigenous fruits and vegetables (TIFVs) are grown small-scale, mostly in home gardens and marginal lands or simply gathered from the wild, cultivated fields, and fallow lands. Their resilience to pests and diseases and adaptability to low-input conditions makes them suitable for agricultural production in financially constrained rural communities. TIFVs are generally rich in micronutrients that can contribute to improving the nutritional quality of meals. They can make significant nutritional contributions to the diet by providing vitamins, minerals, fiber, and antioxidants. Incorporating indigenous vegetables into diets can promote dietary diversity and contribute to improved health and nutrition while indirectly helping to conserve vanishing genetic resources.

The International Institute of Rural Reconstruction (IIRR) in collaboration with the Department of Science and Technology – Food and Nutrition Research Institute (DOST-FNRI) and, the Department of Education (DepEd) developed the Integrated School Nutrition Model (ISNM) in the Philippines with support from the International Development Research Center in Canada in 2016. This involved the establishment of a network of *Lighthouse Schools*¹ (LSs) and school-

¹ A [lighthouse school](#) is a focal point for establishing evidence and for supporting the advocacy and outscaling efforts of school nutrition by the Department of Education in the Philippines.

based *Crop Museums*² (CMs) which are located within the network of LSs. The CMs serve as seed banks fostering the multiplication and exchange of crop types and varieties across schools, and in some cases, broader local communities. The LSs serve as action research sites of the ISNM program where the integration of school feeding, nutrition education and school gardens are demonstrated, and evidence is established.

There are currently 273 LSs (public elementary schools) nationwide representing 221 school divisions. These schools and associated CMs have been in operation for over 5 years and are proving very effective in promoting biodiverse garden systems, conservation, and availability of cultivars of traditional and locally adapted vegetables, fostering dietary diversity and improved consumption of nutrient-dense vegetables. They are also often linked with community gardens and homestead gardens to ensure the conservation and availability of traditional vegetables in school districts.

This study provides evidence on the nature and state of TIFVs conservation efforts by schools in the Philippines. It also elaborates on opportunities for the promotion of agrobiodiversity conservation, specifically in support of sustainable healthy diets for students. The study findings contribute to the Work Package 2 of the Fruit and Vegetables for Sustainable Healthy Diets (FRESH) Initiative of CGIAR.

The study sought to address the following research questions:

1. What roles have schools played in promoting biodiverse garden systems, conservation, and availability of cultivars of traditional and indigenous fruits and vegetables?
2. What are the vegetable crop species available in the school-based Crop Museums and Lighthouse Schools?
3. What are the preferred traditional and indigenous fruits and vegetables that are grown in school gardens and utilized in school canteens and/or school feeding programs?
4. What are the threats and conservation gaps of promoting traditional and indigenous fruits and vegetables?

2. Methodology

Data for this study were gathered through an online survey, followed by an online conference with a sample of schools from across the country. Both activities were conducted in collaboration with the Department of Education - Bureau of Learners Support Services (DepEd-BLSS); and were officially approved and endorsed through the issuance of DepEd. Memorandum No. 2022-03-3731 titled "Conduct of Integrated School Nutrition Model Online

² [Crop museums](#) in schools serve as a focal point for saving crop varieties. This is a garden where teachers, students, and community members can view a diverse range of nutritionally relevant and climate hardy vegetables. They also serve as nurseries (source of planting materials) for surrounding schools and communities.

Conference" by the DepEd Undersecretary for Governance and Field Operations - Revsee Escobedo.

The study targeted those Lighthouse Schools (LSs) and school-based Crop Museums (CMs) that have conducted activities on the conservation and promotion of traditional and indigenous fruits and vegetables (TIFVs) in their schools, adjacent schools, and within their local communities, for at least 1-3 years. See Figure 1 for the distribution of the schools that participated in the study.

2.1 Online Survey

The online survey was administered using Google Forms from 19 December 2022 to 10 January 2023. LSs, CMs, and ISNM focal persons at the Regional, Division, and school-level were the target respondents of the online survey. Pre-testing was undertaken with 20 Department of Education Regional and Division Office representatives to check for questionnaire flaws, and to ensure that questions and choices were understood by the target respondents. Adjustments were made according to the online survey questionnaire.

2.2 Online Conference

The online conference using Zoom (video conferencing software) was conducted between January 12-13, 2023, and was co-facilitated by the DepEd-BLSS and IIRR. Initial results of the online survey were presented and discussed in small groups, wherein participants also shared their strategies and recommendations to strengthen TIFVs conservation through LSs and CMs.

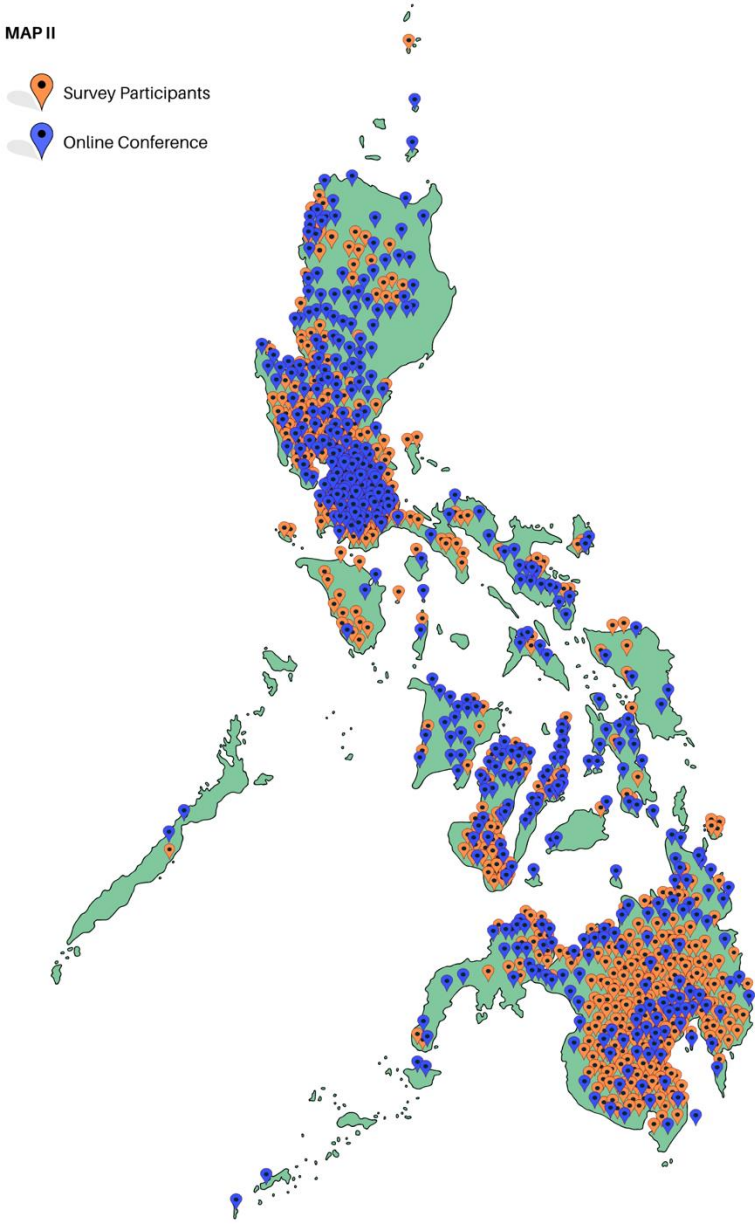
2.3 Data Collection and Analysis

Quantitative data were derived from the online survey. IIRR validated this data and elicited further explanations on responses to the online survey during the online conference. Further, data were analyzed using descriptive statistics to show trends and presented in either tabular or graphical forms. Google Sheets was used as a platform for collaboration during data validation and cleaning; and data processing and analysis were performed using Microsoft Excel.

2.4 Limitations of the Study

This study analysed data gathered from the responses and discussions from the participating schools of the online survey and conference. Both were targeted to only those LSs, CMs and regional coordinators implementing the ISNM, that have cultivated and promoted TIFVs for over three years.

Figure 1: Distribution of participating schools on the online survey and conference



3. Results and Discussion

3.1 Distribution of Respondents

Respondents of the online survey and participants of the online conference were ISNM focal persons, and project officers assigned to the Gulayan sa Paaralan Program (GPP)³ or school gardening program, School-Based Feeding Program (SBFP)⁴, and Nutrition Education and Promotion Program (NEPP)⁵ of DepEd at the Regional Offices, Schools Division Offices, and School Level from the seventeen (17) regions of the country. Regional and Division offices oversee monitoring, evaluation, and implementation of the GPP, SBFP and NEPP programs at the school level; while school-level representatives are the direct implementers of the listed programs. See Table 1 for the governance level and designations of the respondents.

³The Gulayan sa Paaralan Program aims at promoting food security and good nutrition among students, as well as teaching them the value of agriculture and environmental protection. Under this program, schools are encouraged to establish vegetable gardens within their premises, which will serve as a hands-on learning experience for students.

⁴ The School-based Feeding Program (SBFP) aims at providing a daily nutritious meal to undernourished students in public schools. Under the SBFP, the DepEd. provides funding to schools to purchase ingredients and prepare meals that meet the children's recommended daily allowance for essential nutrients. The meals are usually prepared on-site by trained cooks and are distributed to eligible students on a daily basis. The program is designed to address the problem of hunger and malnutrition among school-aged children, which can have negative effects on their physical and cognitive development, academic performance, and overall health.

⁵The Nutrition Education and Promotion Program (NEPP) is a comprehensive program that promotes healthy lifestyles and good nutrition habits among students, teachers, and parents. It recognizes the important role of education in addressing the problem of malnutrition and its associated health risks and aims to empower individuals and communities to make informed choices about their health and wellbeing.

Table 1: Target respondents of the online survey and participants of the ISNM online conference

Governance Level	Target Participants
Regional Office	Nutritionist - Dietitian II, ESSD
	Project Development Officer, GPP/ISNM Coordinator
Schools Division Office	Gulayan Sa Paaralan (GPP) Division Focal person, SGOD
	Nutrition Education Coordinator, CLMD
Schools (1 representative per school)	School head of Lighthouse School
	Nutrition Education and Promotion Coordinator
	GPP Coordinator
	SBFP Coordinator

3.1.1 Online Survey Respondents Profile

One thousand one hundred fourteen (1,114) Regional, Division, and school level coordinators responded to the online survey as shown in Tables 2 and 3. Three hundred twelve (312 or 28.01%) respondents represent the Regional and Division coordinators, 358 (32.14%) are from the Lighthouse Schools, 422 (37.88%) are from the school-based Crop Museums, and 22 (1.97%) are from Satellite Lighthouse Schools (these are schools trained and/or adopted by a Lighthouse School).

All regions were represented though it is important to note that there was under three percent representation from certain regions (target is at least 5% per region) i.e., CARAGA, CAR, Regions II, IVB, V, VI, IX, and XII. Distribution of participating schools is shown in the map (See Figure 1). A total of 215 out of the 273 Lighthouse Schools (79%) responded to the online survey.

Table 2: Distribution of online survey respondents by governance level and designation

Governance Level	Target Participants	Count (N=1,114)	Percentage (%)
Regional Office	Nutritionist - Dietitian II, ESSD	9	0.18
	Project Development Officer, GPP/ISNM Coordinator	10	0.90
Schools Division Office	Gulayan Sa Paaralan (GPP) Division Focal person, SGOD	112	10.05
	School-based Feeding (SBFP) Division Focal Person, SGOD	124	11.13
	Nutrition Education Coordinator, CLMD	6	0.54
Lighthouse School (1 representative per school)	School head of Lighthouse School	84	7.54
	Nutrition Education and Promotion Coordinator	30	2.69
	GPP Coordinator	524	47.04
	BMI Coordinator	6	0.54
	Canteen Coordinator	53	4.76

Table 3: Distribution of online survey respondents by region and by school type

Regions	Regional and Division Office Representatives	Light -house School	School Crop Museums	*Satellite Lighthouse Schools	Total
CAR	9	7	8	2	26 (2.33%)
CARAGA	9	4	13	0	26 (2.33%)
NCR	12	18	5	2	37 (3.32%)
Region I	25	39	3	0	67 (6.01%)
Region II	12	13	0	0	25 (2.24%)
Region III	34	30	31	0	95 (8.53%)
Region IV-A	32	79	62	3	176 (15.80%)
Region IV-B	11	6	10	0	27 (2.42%)
Region V	8	18	3	0	29 (2.60%)
Region VI	15	15	1	1	32 (2.87%)
Region VII	32	11	28	1	72 (6.46%)
Region VIII	17	20	2	0	39 (3.50%)
Region IX	11	10	1	1	23 (2.06%)
Region X	37	31	37	4	109 (9.78%)
Region XI	37	47	218	8	310 (27.83%)
Region XII	11	10	0	0	21 (1.89%)
Grand Total	312 (28.01%)	358 (32.14%)	422 (37.88%)	22 (1.97%)	1,114 (100%)

*Satellite Lighthouse School are schools trained and/or adopted by a Lighthouse School.

3.1.2 Online Conference Respondent's Profile

Eight hundred fifty (850) Regional, Division, and school-level representatives participated in the online conference via Zoom. See Table 4 for the distribution of participants by governance level and designation. Forty-six (46 or 5.41%) are regional coordinators representing the 17 regions of the country, 398 (46.82%) are the division coordinators from the 222 Schools Division Offices, 314 (36.94%) are representatives of the 273 Lighthouse Schools, and 92 (10.82%) are coordinators from school-based Crop Museums.

Table 4: Distribution of Online Conference participants by governance level and designation

Governance Level	Designation	Count	Percentage (%)
Regional Office	Nutritionist - Dietitian II, ESSD	15	1.76
	Project Development Officer, GPP/ISNM Coordinator	31	3.65
Schools Division Office	Gulayan Sa Paaralan (GPP) Division Focal person, SGOD	171	20.12
	School-based Feeding (SBFP) Division Focal Person, SGOD	218	25.65
	Nutrition Education Coordinator, CLMD	9	1.06
Lighthouse School (1 representative per school)	School head of Lighthouse School	54	6.35
	GPP Coordinator	169	19.88
	SBFP Coordinator	78	9.18
	Nutrition Education and Promotion Coordinator	13	1.53
School Crop Museum	GPP/SBFP/ Canteen Coordinator	92	10.82
TOTAL		850	100.00

3.2 Strategies for the Conservation and Promotion of Traditional and Indigenous Fruits and Vegetables by the Lighthouse Schools and Crop Museums

Agrobiodiversity conservation is the practice of preserving a wide variety of plants, animals, and microorganisms that make up agricultural ecosystems. This is important because it helps maintain genetic diversity, which can improve a field's resilience to pests, diseases, and environmental stresses. Incorporating agrobiodiversity conservation into schools is an effective way to provide students with the knowledge and skills to protect local plant varieties. Further, engaging the wider community to help conserve agrobiodiversity in school gardens can not only strengthen community ties but also the link between the formal and informal sectors in plant genetic resources' conservation and utilization.

3.2.1 School Activities for the Conservation of TIFVs

Agrobiodiversity conservation, particularly the conservation and sustainable use of the genetic diversity of crops includes the preservation and promotion of the use of traditional or locally-adapted crop varieties that have been cultivated by small farms and indigenous communities for generations. Most survey respondents support TIFVs conservation by promoting their planting (97.67%) and consumption (96.95%) in schools and communities. One thousand seventy-one (96.14%) grow them in their school and community, while seed saving is done by 982 (88.15%) and distribution of planting materials is done by 873 (78.37%). Seed collection (58.98%) and seed exchange events (53.95%) are other examples of TIFVs conservation activities in schools, as indicated in Figure 2.

Promotion of planting and consumption of TIFVs in schools and communities creates awareness about the importance of TIFVs for food security, nutrition, and biodiversity conservation. School activities to promote planting and consumption of TIFVs involve organizing home gardening contests, cooking demonstrations, and educational campaigns.

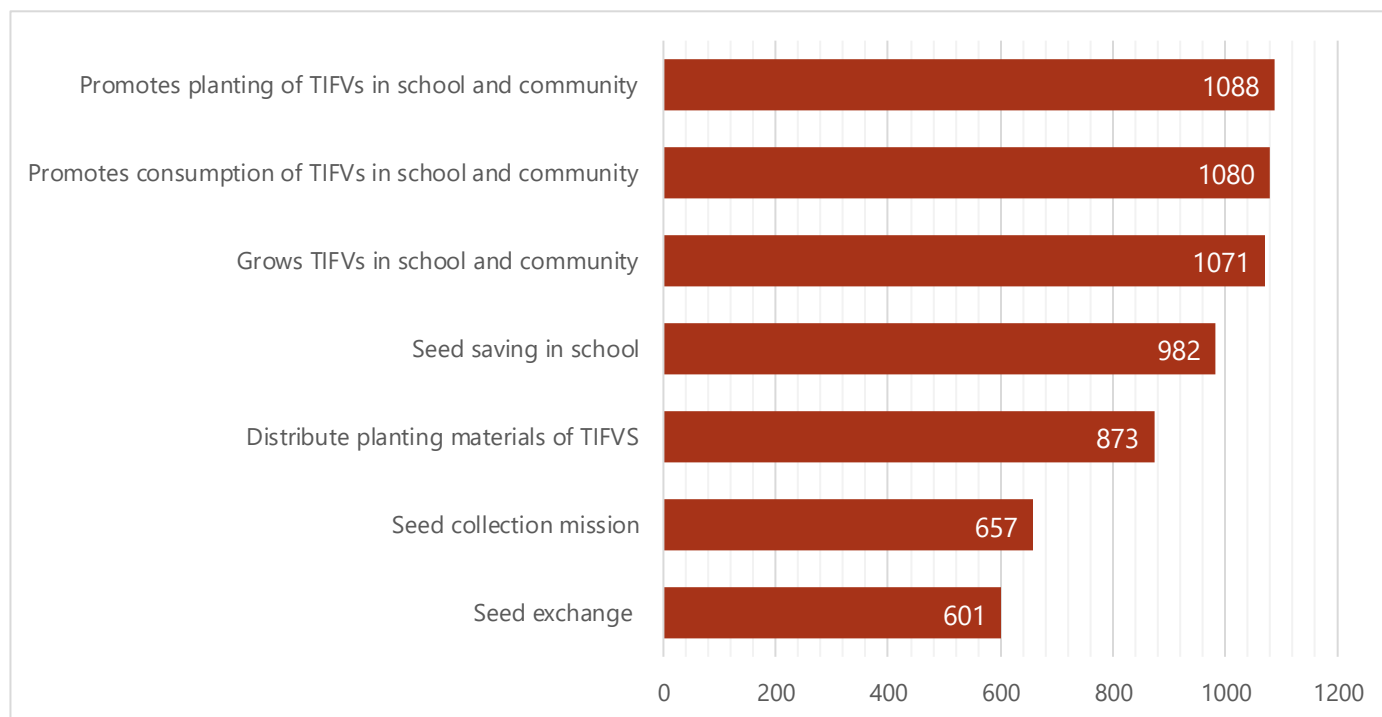
Distribution of TIFVs planting materials. Lighthouse Schools and school-based Crop Museums propagate and distribute planting materials of nutrient-dense food crops. This complements the promotion of home gardens among students and parents and was especially important during the pandemic when access to food was limited. See Section 3.5 for more information on schools' planting materials distribution methods.

Seed saving in schools includes selection of the healthiest, most resilient, and productive plant type and species that they want to maintain and grow for the following years. They use the traditional technique of storing seeds in airtight containers with desiccants i.e., charcoal, naphthalene balls.

Seed collection missions refer to the occasional efforts of schoolteachers where they go out to remote areas, meet with local farmers and indigenous communities, in search of new crop varieties to grow in school gardens.

Schools **exchange seeds** and share information about their collections. Schools prepare their seeds for the exchange by cleaning them, drying them, and labeling them. By partnering with other schools, community organizations, and local farmers, important and endangered local cultivars are promoted and conserved.

Figure 2: Activities on conserving traditional and indigenous fruits and vegetables done by the schools



3.2.2 School activities for the Promotion of TIFVs

The respondents of the online survey and online conference listed a range of specific strategies to promote agrobiodiversity in schools. These are listed in Table 5.

School gardens as an avenue for students and parents to grow and learn about TIFVs.

School gardens can serve as an outdoor classroom and provide hands-on learning experiences for students. School gardens provide an excellent opportunity for students to learn about different crops, their adaptation to changing climates, and their importance in local food systems.

Gardens can be used to conserve vanishing local plant varieties and their diversity. Their integration into curriculum and lessons emerged as an important method used by schoolteachers to promote TIFVs. Schoolteachers have also incorporated topics on nutritional value, cooking preparations, climate adaptability, and propagation of TIFVs in their lessons in various subjects (such as *Edukasyon sa Pagpapakatao at Pangkabuyan (EPP)* and Science). Some school teachers promote them through integration into subjects like Mathematics, English, and Social Studies. Schools can incorporate agrobiodiversity conservation into various

subjects and this can help to promote cultural and ecological awareness among students (Oro et al., 2018b).

Awareness and education campaigns on TIFVs are also being undertaken by the school teachers. Schools’ outreach programs such as *Brigada Eskwela*⁶, Nutrition Month activities, and community pantry (that involves the distribution of seeds, seedlings, fresh vegetables, posters, recipe booklets, and videos) are regularly undertaken to engage parents and other stakeholders. Social media and capacity building activities on the adaptability of crops and cultivars to environmental stresses; and the nutritional value and cooking preparation of TIFVs; during health, nutrition, and environmental campaigns and activities are being done as well.

Incentivization- through awarding of certificates and grade incentives to students and parents- promotes planting and consumption of TIFVs in their homes and community. Volunteer parents engaged in school gardening and cooking activities are provided with fresh vegetables, seeds and seedlings, and cooked food from the excess meals of the school canteen or feeding program. During Division- level food exhibition events, school feeding teachers and canteen coordinators were encouraged to develop innovative recipes featuring and utilizing indigenous vegetables. Some of these nutritious recipes are served in school canteens to support income generation of schools.

Table 5: School activities on the promotion of TIFV to students and parents

Strategies of the schools on the promotion of TIFVs	Count of respondents
Growing TIFVs in school gardens where students and parents can see and learn about them.	1,090
Integration of TIFVs into the school curriculum and lessons	1,070
Integration of TIFVs into school activities and outreach programs (such as <i>Brigada Eskwela</i> , distribution of report cards, distribution and retrieval of modules, community pantry, tree planting activities, ‘Nutrition Month’ activities)	1,054
Social media campaign utilizing Facebook, Instagram, and Twitter to promote awareness and education on TIFVs (Creation of Facebook Group Community for Vegetable Garden	797

⁶ The *Brigada Eskwela* is annual and nationwide school maintenance program. Here, over the week before which classes begin, local communities volunteer their time and skills to conduct clean-ups, minor to medium repairs and maintenance work in school sites. This helps ensure that the schools are all set for a new academic year.

Advocates)	
Capacity building activities (such as face-to-face training and webinar on the adaptability to environmental stresses, nutritional value, and cooking preparation of TIFVs; and during health talks/health awareness campaigns, the Division Nutrition Exposition, the Youth for Environment in Schools Organization (YES-O) campaigns and activities)	786
Recipe development using TIFVs for school feeding and canteen	863
Development and distribution of Information, Education, and Communication (IEC) and promotional materials on TIFVs (i.e., posters, fliers, videos, infographics)	718
Home Visits	876
Gardening and cooking contests that highlight TIFVs and giving grade incentives to students and parents (E.g., the <i>Gulayan sa Tahanan</i> program)	864
Distribution of seeds and seedlings	959
Distribution of fresh vegetables	999

3.2.3 Seed Saving

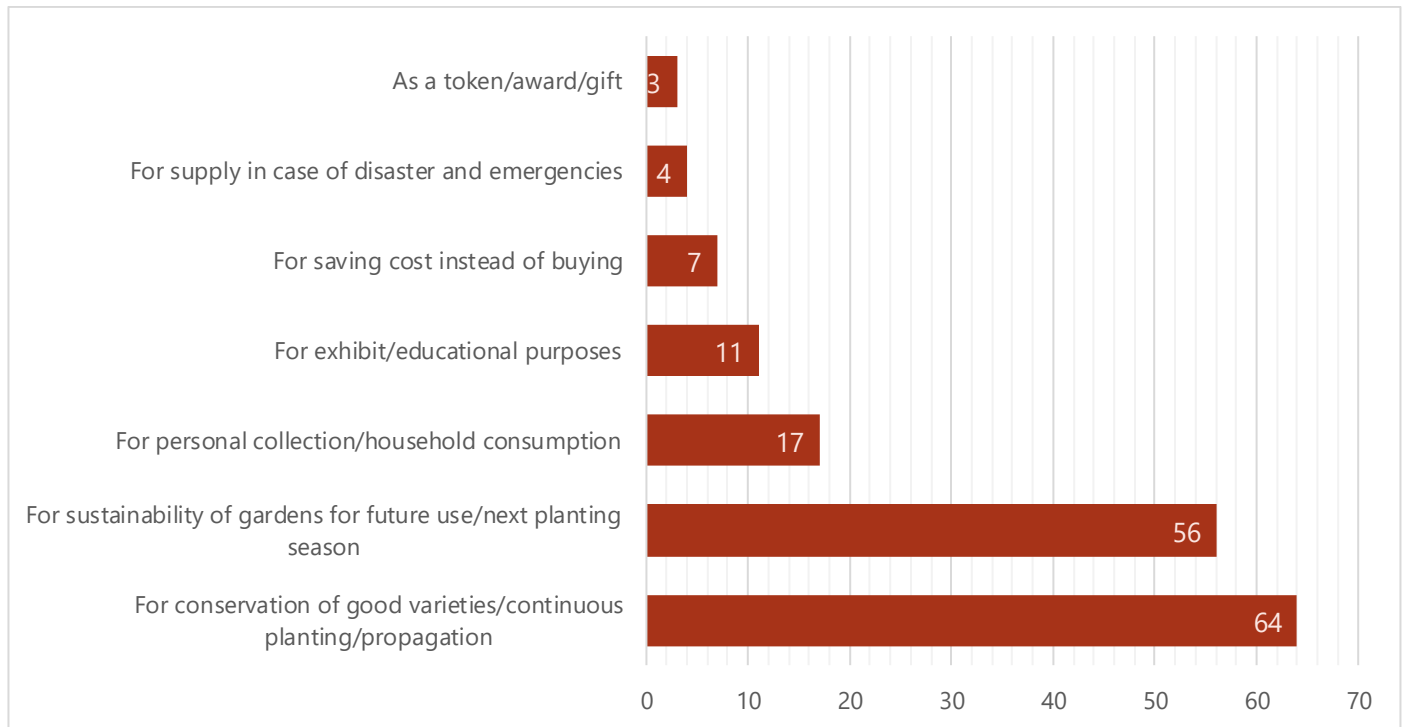
Saving seeds of traditional crop varieties helps to preserve genetic resources and their diversity in agriculture. In addition, ecosystem services and food culture associated with this biodiversity is conserved. Traditional crop varieties have often adapted to local and changing growing conditions (such as climate). This means they are often more resilient (better suited to withstand environmental changes such as drought or pests). By saving and distributing seeds of these crops, schools and communities help conserve varieties that are proven to be well-adapted to local conditions (Ebert, 2014).

Seed saving, particularly those of TIFVs, is done by schools for various reasons as shown in Figure 3. Lighthouse Schools and school-based Crop Museums save seeds mainly for the conservation and multiplication of useful varieties. Saving seeds also helps them sustain their school gardens with the assurance of seed availability for future planting. Saving seeds

reduces their seed costs, since they can reuse the seeds from the previous year's crop instead of purchasing new seeds.

Some teachers shared that they save seeds for their personal collection at home; for school exhibits to educate students and parents on local crop cultivars; and others use the seeds as a token of appreciation for school visitors.

Figure 3: Reasons why schoolteachers save TIFVs' seeds



3.2.4 Seed Exchanges

Schools organize seed exchanges and conservation programs where students can learn about seed saving and can be involved in the conservation of local plant varieties that are at risk of disappearing (Hunter et al., 2020). Most Lighthouse Schools and school-based Crop Museums have organized seed exchanges (53.95%) and seed collecting missions (58.98%) in their schools, Districts, and Division Offices as shown in Figure 2.

IIRR collaborated with DepEd-BLSS through the issuance of OUA Memorandum 0422-0049 titled 'Local Agrobiodiversity Conservation and Dissemination Drive Project', dated April 2022. IIRR provided *Seed Diversity Kits*⁷ containing a variety of indigenous and locally adapted vegetable seeds to all 273 Lighthouse Schools across the country. All Lighthouse Schools were tasked with conserving and propagating these seed kits; and distributing planting materials to

⁷ Seed Diversity Kits are starter kits that contain a diverse range (at least 15) of crop varieties in small quantities. They usually include both locally adapted, traditional varieties and improved varieties

community members to promote home gardens. Seed exchange and seed fairs are important tools for conserving and promoting traditional crop cultivars, and can contribute to preserving genetic diversity, promoting cultural heritage, enhancing food security and nutrition, and empowering local communities. By exchanging seeds and knowledge, the formal and informal plant genetic resources sectors, educators and farmers can learn from one another, share best practices, and build solidarity around the conservation and promotion of traditional crop cultivars. Seed exchange is also often facilitated through local networks of farmers, which can help to build social cohesion and community empowerment (Pautasso et al., 2013; Jeffrey, 2017; Oro et al., 2018c).

3.3 Crop Diversity Cultivated in School Gardens and Utilized in School Feeding and Canteens

Crop diversification can provide a range of benefits in schools, including improved nutrition, soil health, climate resilience, education, and income generation. Diversifying the crops grown in school gardens provides a greater variety of fresh produce for school feeding programs. This can help improve the nutritional quality of school meals and promote better health among students.

IIRR's Lighthouse Schools data from 2016 showed that the average number of crops grown by schools in the Cavite province was five- most commonly *Pechay* (*Brassica rapa L.*) which is a green leafy vegetable, *talong* or eggplant (*Solanum melongena*), *kamatis* or tomato (*Solanum lycopersicum and spp.*), *sili* or chilli (*Capsicum frutescens*), and *mustasa* or mustard greens (*Brassica rapa subsp. oleifera*). In 2018, there was a recorded increase of as many as 20 types of vegetables grown in the schools mainly due to the introduction and promotion of traditional and indigenous vegetables. Improved garden resilience (attributed to diversification using traditional and indigenous vegetables) is now reported. GPP school coordinators have highlighted that this is because such crop cultivars can tolerate environmental stresses such as drought and flood and are resilient to pests (Oro et al., 2018a).

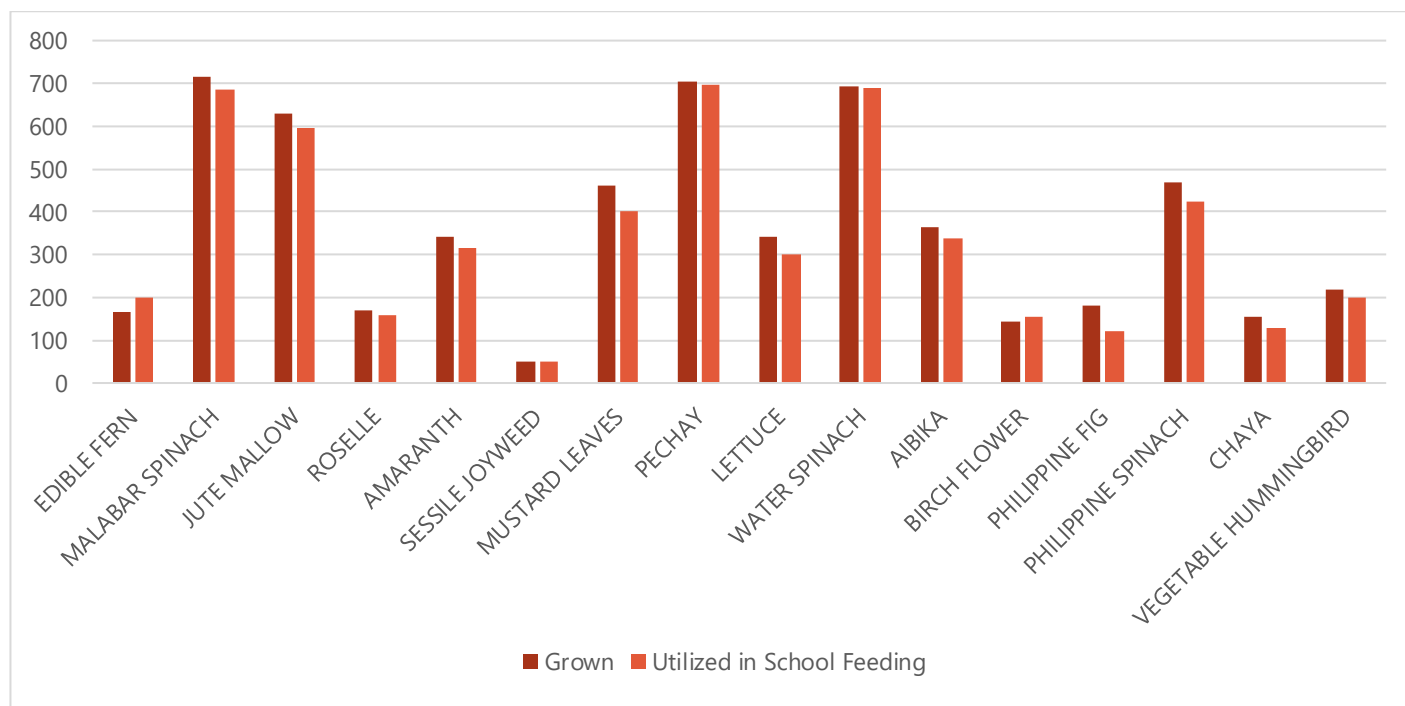
Table 6 shows the online survey responses on the average number of crop types grown in schools. Three hundred eight (35.86%) of the survey respondents indicated that they grow 5-8 types of crops; while 230 (26.78%) expressed that they grow above 12 types of crops. As shown in Figures 4-8, a variety of vegetables are available in almost all school gardens and much of these are utilized in school feeding.

Table 6: Average number of crop types grown in schools

Strategies of the schools on the promotion of TIFVs	Count of Respondents (N=859)	Percent (%)
Less than 5 types of crops	169	19.67
5-8 types of crops	308	35.86
9-12 types of crops	152	17.69
Above 12 types of crops	230	26.78

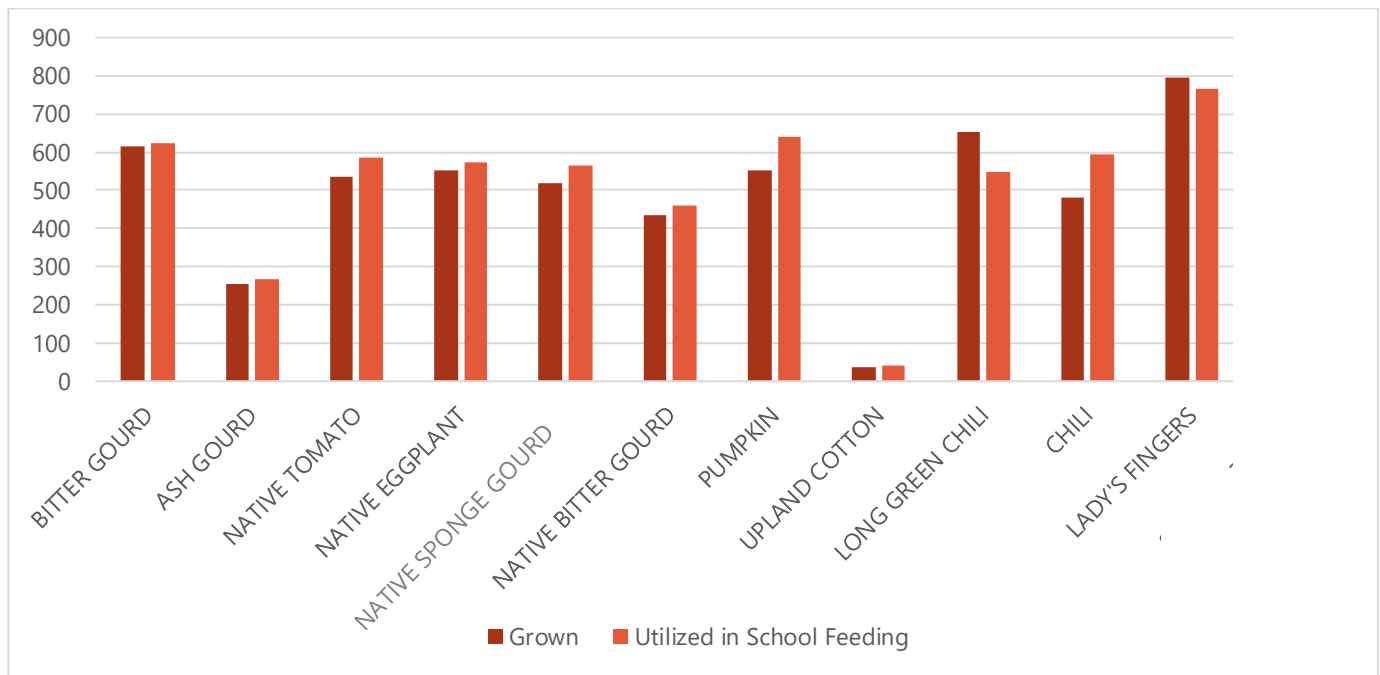
Leafy vegetables are available in most schools but there is a variance in their consumption (See Figure 4). Some traditional and indigenous leafy vegetables like *Lupo* or sessile joyweed (*Alternanthera sessilis*), *Himbabao* or birch flower (*Broussonetia luzonica*), and *Pako* or edible fern (*Diplazium esculentum*) are only consumed in regions where it is associated with local food heritage and culture.

Figure 4: Leafy vegetables grown and utilized in school feeding



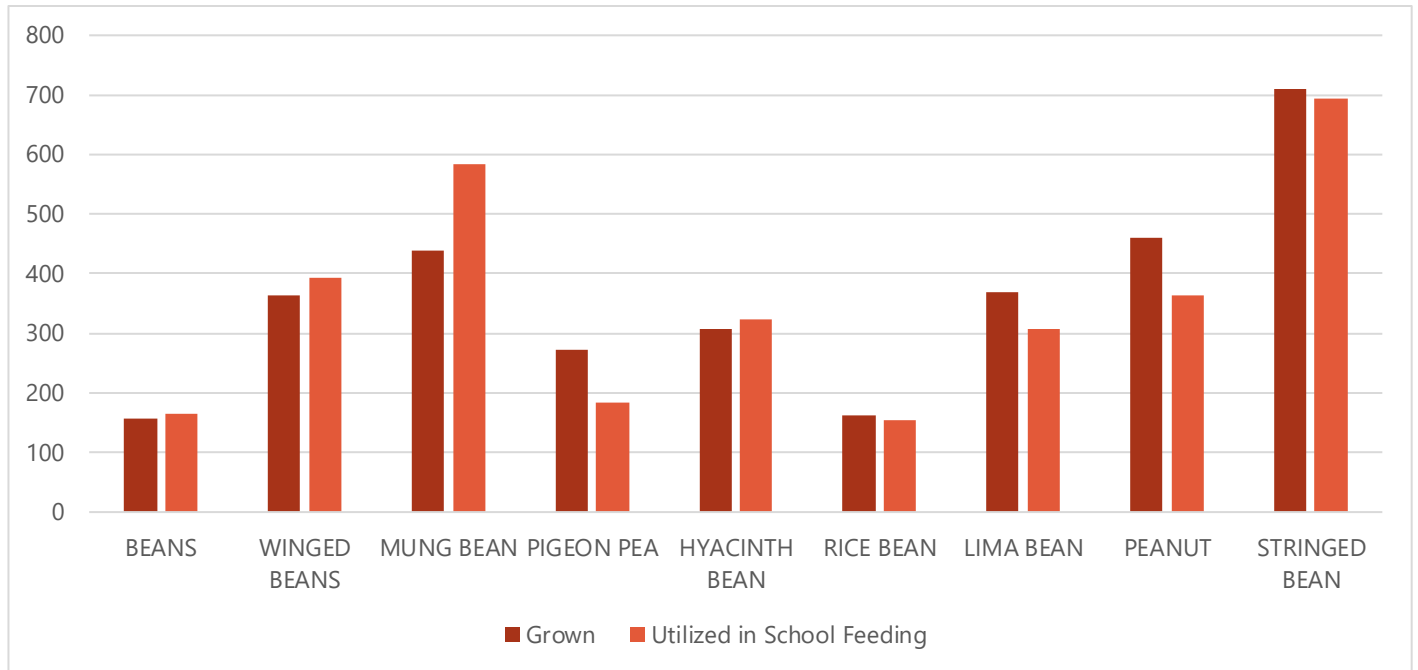
Okra or lady's finger (*Abelmoschus esculentus and spp.*) is the most grown and consumed in almost all schools. Other commonly grown fruit vegetables include *Sili Panigang* or long green chilli (*Capsicum annuum var. longum*), *Ampalaya* or bitter gourd (*Momordica charantia*), *Upo* or bottle gourd (*Lagenaria siceraria*), and *Kalabasa* or pumpkin (*Cucurbita maxima*). As shown in Figure 5, many fruit vegetables are utilized in school feeding, but their cultivation in school gardens is relatively lower- this includes native varieties of *Kamatis* or tomato (*Solanum lycopersicum and spp.*), *Talong* or eggplant (*Solanum melongena and spp.*), *Patola* or sponge gourd (*Lufa cyclindrica*), and bitter gourd. Indigenous vegetables such as *Kundol* or ash gourd (*Benincasa hispida (Thunb.) Cogn.*) and *Kapas-kapas* (*Telosma procumbens*) are grown in some schools but need more promotion through distribution of seeds, and availability of information on its cooking preparations.

Figure 5: Fruit Vegetables grown and utilized in school feeding



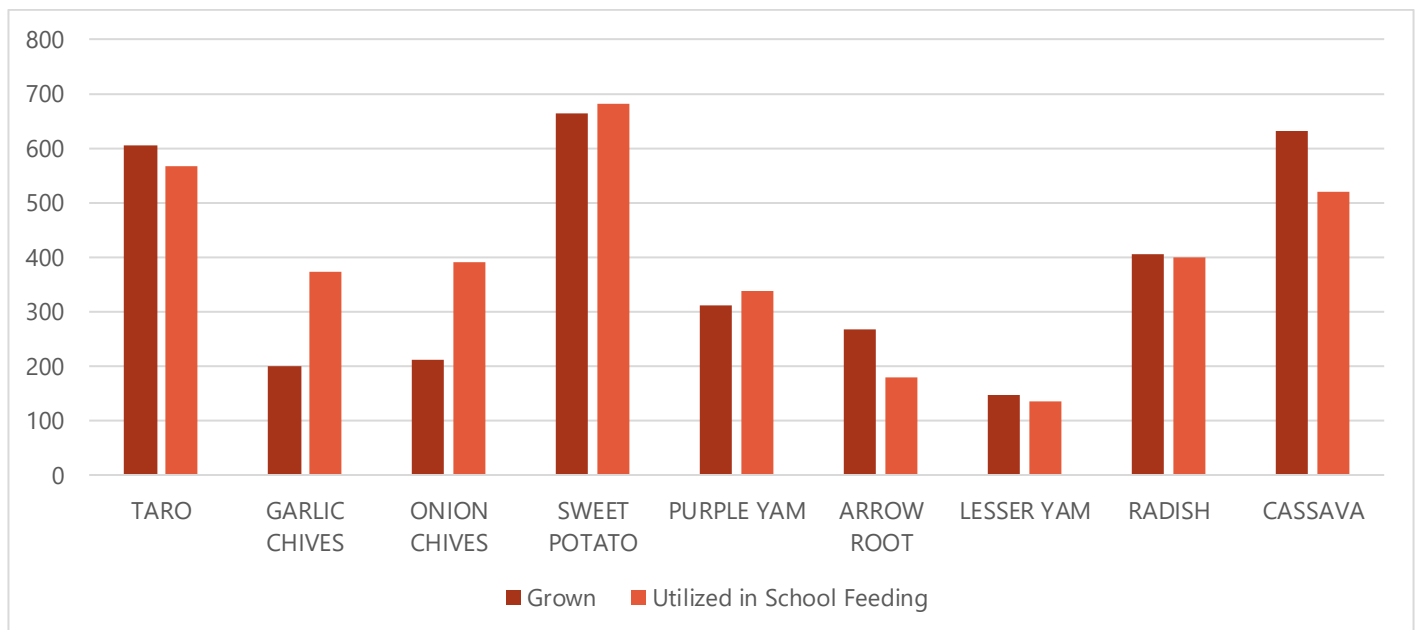
As seen in Figure 6, *Sitaw* or stringbean (*Vigna unguiculata subsp. sesquipedalis*) is the most widely grown and consumed legume in schools. *Munggo* or mungbean (*Vigna radiata*) is consumed in most schools but its cultivation remains low. Similarly, *Bataw* or hyacinth bean (*Lablab purpureus*) and *Sigarilyas* or winged bean (*Psophocarpus tetragonolobus*) are also consumed more commonly than they are grown. On the other hand, *Mani* or peanut (*Arachis hypogaea*), *Patani* or lima bean (*Phaseolus lunatus*), and *Kadyos* or pigeon pea (*Cajanus cajan*) are grown by half of the schools, though they are not highly utilized in school feeding.

Figure 6: Legumes grown and utilized in school feeding



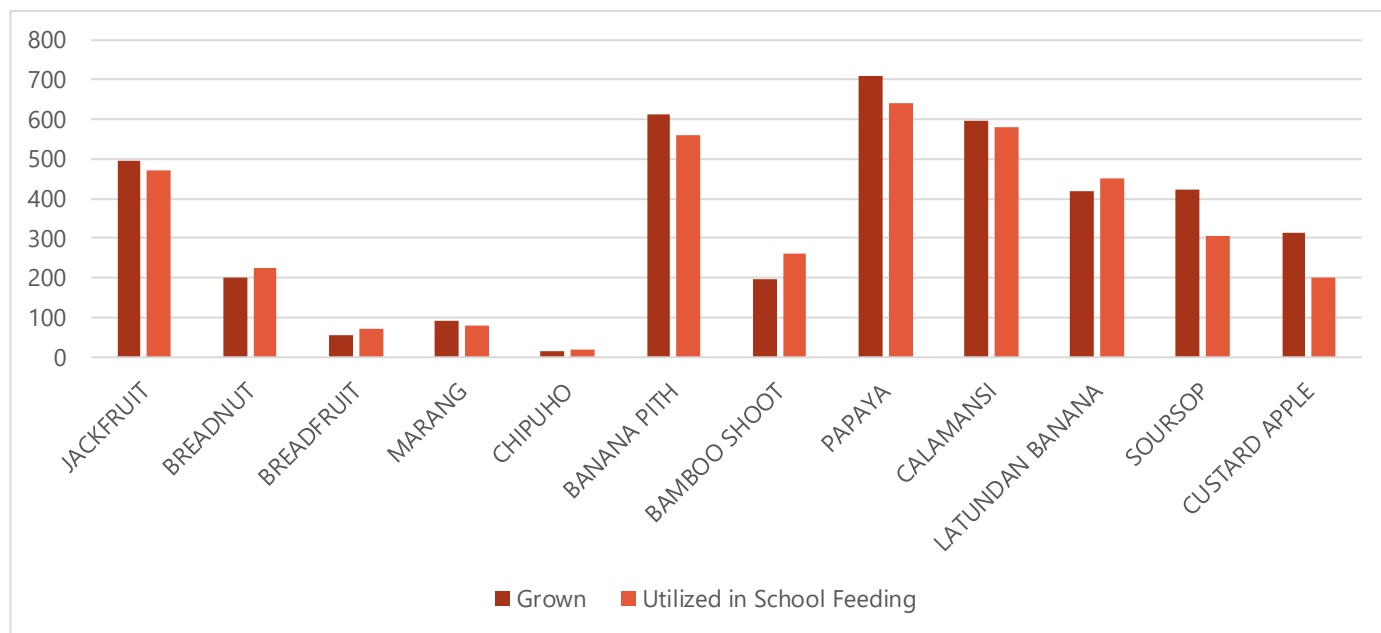
Roots and tubers such as sweet potato (*Ipomoea batatas*), taro (*Colocasia esculenta*), and *Labanos* or radish (*Raphanus sativus*) are commonly grown and consumed in most schools (See Figure 7). However, *Bawang gulay* or garlic chives, *Lasona gulay* or onion chives, and *Ube* or purple yam (*Dioscorea alata*) are grown in fewer schools than they are consumed in.

Figure 7: Roots and tubers are grown and utilized in school feeding



As seen in Figure 8, fruit trees such as papaya (*Carica papaya*), calamansi (*Citrofortunella microcarpa*), and *Ubod ng saging* or banana pith are generally available in all schools but a minor difference in their consumption is apparent. The same trend can be observed with *Langka* or jackfruit (*Artocarpus heterophyllus*), *Guyabano* or soursop (*Annona muricata*), and *Atis* or custard apple (*Annona reticulata*). In contrast, Latundan bananas (*Musa acuminata* x *M. balbisiana*) are consumed in more schools than they are grown in.

Figure 8: Fruit trees grown and utilized in school feeding



Listed in Table 7 are the fruits, vegetables, and herbs available in the community, grown in schools, and served in schools. Many are native fruits and herbs whose utilization in school feeding and canteens can be improved.

Table 7: Fruits, vegetables, and herbs available in the community that are served in school feeding

English and Local Names	Scientific Name
1. Wild Yam, <i>Abalong</i>	<i>Arum colocasia</i> Linn.
2. Job tear, <i>Adlai</i>	<i>Coix lacryma-jobi</i> .
3. <i>Alupayi</i>	<i>Homalomena philippinensis</i> Engl.
4. Weeping fig, <i>Apalit</i>	<i>Ficus benjamina</i>
5. Jamaican cherry, <i>Aratilis</i>	<i>Muntingia calabura</i>

6. Arugula	<i>Eruca vesicaria</i>
7. Bell Pepper, <i>Atsal</i>	<i>Capsicum annuum</i>
8. Annatto, <i>Atsuete</i>	<i>Bixa orellana</i>
9. Avocado	<i>Persea americana</i>
10. Spanish joint fir, <i>Bago</i>	<i>Gnetum gnemon</i> Linn.
11. Mexican turnip	<i>Pachyrhizus erosus</i>
12. Star Fruit, <i>Balimbing</i>	<i>Averrhoa carambola</i>
13. Cassava, <i>Balinghoy</i>	<i>Manihot esculenta</i>
14. Lakatan bananas	<i>Musa acuminata</i>
15. Butuan fruit, <i>Batawan, Binukaw</i>	<i>Garcinia binucao</i>
16. Pepper elder, <i>Bihod-bihod, Pansit-pansitan</i>	<i>Peperomia pellucida</i>
17. Blue Ternate, <i>Samsamping, Pukinggan</i>	<i>Clitoria ternatea</i>
18. Blueberry	<i>Vaccinum spp.</i>
19. Currant tree, <i>Bugnay, Bignay</i>	<i>Antidesma bunius</i>
20. Black jack, <i>Burburtak, Puriket</i>	<i>Bidens pilosa</i>
21. Burmese Cana	<i>Canna indica</i>
22. Canistel	<i>Pouteria lucuma</i>
23. Carrot	<i>Daucus carota</i>
24. Cauliflower	<i>Brassica oleracea</i> var. <i>botrytis</i>
25. Celery, <i>Kinchay</i>	<i>Apium graveolens</i>

26. Chayote, <i>Sayote</i>	<i>Sechium edule</i>
27. Coconut, <i>Niyog</i>	<i>Cocos nucifera</i>
28. Corn (white), <i>Mais</i>	<i>Zea mays</i>
29. Cotton fruit, <i>Santol</i>	<i>Sandoricum koetjape</i>
30. Cucumber, <i>Pipino</i>	<i>Cucumis sativus</i>
31. Cucumber tree, <i>kamias, kalamismis</i>	<i>Averrhoa bilimbi</i>
32. Sweet orange, <i>Dalandan</i>	<i>Citrus aurantium L</i>
33. Key lime, <i>Dayap</i>	<i>Citrus aurantiifolia.</i>
34. Dill	<i>Anethum graveolens</i>
35. Dragon fruit	<i>Hylocereus undatus</i>
36. Durian	<i>Durio zibethinus L.</i>
37. Elephant apple, <i>Katmon</i>	<i>Dillenia philippinensis</i>
38. Giant swamp taro, <i>galyang</i>	<i>Cyrtosperma merkusii (Hassk.) Schott</i>
39. Avocado	<i>Persea americana</i>
40. Ginger, <i>Luya</i>	<i>Zingiber officinale</i>
41. Guava, <i>Bayaba</i>	<i>Psidium guajava</i>
42. Drumstick tree, <i>Malungay</i>	<i>Moringa oleifera</i>
43. Indian three-leaved yam, <i>Nami</i>	<i>Dioscorea hispida</i>
44. Jack bean, <i>Habas</i>	<i>Canavalia ensiformis</i>
45. Japanese Malunggay, <i>Binahian</i>	<i>Moringa oleifera Lam. Dool (Bik.)</i>

46. Japanese mustard greens, <i>Mizuna</i>	<i>Brassica rapa var. nipposinica</i>
47. Java plum, <i>Lipote</i>	<i>Syzygium polycephaloides</i>
48. Jerjer leaves, <i>Kurkurapot</i>	<i>Brassica eruca</i>
49. Red date	<i>Ziziphus zizyphus (L.)</i>
50. <i>Kaduk</i>	<i>Piper auritum kunth</i>
51. <i>Lanzones</i>	<i>Lansium parasiticum</i>
52. Lemon	<i>Citrus limon L</i>
53. Lemongrass, <i>Tanglad</i>	<i>Cymbopogon citratus</i>
55. Hog plum, <i>Libas</i>	<i>Spondias pinnata</i>
56. Black plum, <i>Lomboy</i>	<i>Syzygium cumini</i>
57. Malabar plum, <i>duhat</i>	<i>Syzygium cumini</i>
58. Malay apple	<i>Syzygium malaccense</i>
59. Mango var. piko	<i>Mangifera indica</i>
60. Mangosteen	<i>Garcinia mangostana</i>
61. Miracle fruit	<i>Synsepalum dulcificum</i>
62. Mulberry	<i>Morus alba</i>
63. Lady's Finger, <i>Okra</i>	<i>Abelmoschus esculentus</i>
64. Oregano	<i>Origanum vulgare</i>
65. Passion fruit	<i>Passiflora edulis</i>
66. Peppermint	<i>Mentha piperita L.</i>

67. Pineapple, <i>Pinya</i>	<i>Ananas comosus</i>
68. Pomegranate	<i>Punica granatum</i>
69. Pomelo, <i>Suha</i>	<i>Citrus maxima</i>
70. Aerial yam	<i>Dioscorea bulbifera</i>
71. <i>Pusu-pusuan, Tagbak, Pelisyokin, Tugis</i>	<i>Hornstedtia conoidea</i> Ridl.
72. Rambutan	<i>Nephelium lappaceum</i>
73. Roselle, <i>Labug</i>	<i>Hibiscus sabdarif</i>
74. Rosemary	<i>Rosmarinus officinalis</i>
75. True pearl onion, <i>Sakurab</i>	<i>Allium ampeloprasum</i> var. <i>sectivum</i>
76. Sapodilla, <i>Chico</i>	<i>Manilkara zapota</i>
77. Indian Snakeroot, <i>Serpentina</i>	<i>Rauwolfia serpentina</i>
78. Sesame, <i>Linga</i>	<i>Sesamum indicum</i>
79. Onion Chives, <i>Sibujing</i>	<i>Allium ampeloprasum</i>
80. Snake Gourd	<i>Trichosanthes cucumerina</i>
81. Spanish plum, <i>Sinegwelas</i>	<i>Spondias purpurea</i>
82. Star apple, <i>Caimito</i>	<i>Chrysophyllum cainito</i>
83. Millaa millaa vine, <i>Tablon, Tublon, Banaken, Kamagsa, Lingaro, Alunot, Malaimus</i>	<i>Elaeagnus Philippensis</i> Perr.
84. Elephant ear, <i>Talyan</i>	<i>Alocasia macrorrhizos</i>
85. Alocasia macrorrhizos	<i>Tamarindus indica</i>
86. Tarragon	<i>Artemisia dracunculus</i>

87. Native gooseberry, <i>Unti</i>	<i>Physalis minima L.</i>
88. Arrowroot, <i>Uraro</i>	<i>Maranta arundinacea</i>
89. Velvet apple, <i>Mabolo</i>	<i>Diospyros blancoi</i>
90. Wax apple, Makopa, <i>tambis</i>	<i>Syzygium malaccense</i>
91. Wild berries, <i>Sudo-sudo</i>	<i>Euphorbia neriifolia L</i>
92. Wild strawberry, <i>Pakwan-damo</i>	<i>Fragaria vesca</i>

3.4 Sources of Traditional and Indigenous Fruits and Vegetables

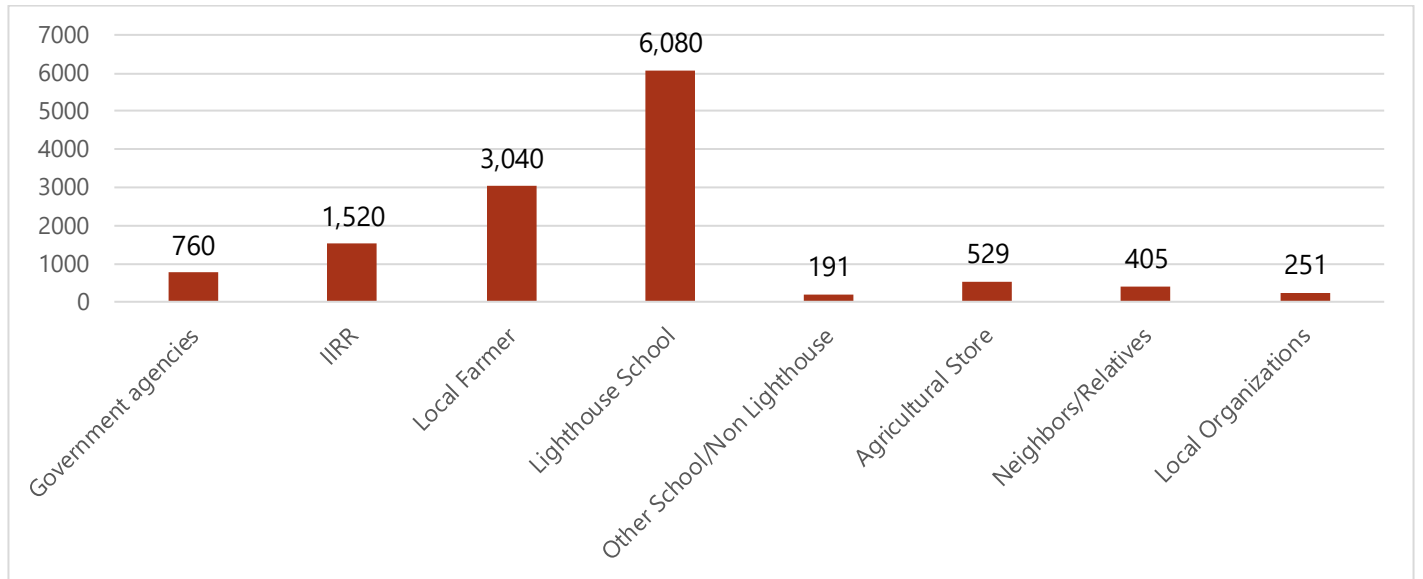
Despite the many conservation activities on TIFVs conducted by schools, online survey respondents expressed that the availability of planting materials for TIFVs is still limited. As shown in Figure 9, Lighthouse Schools are the main sources of TIFVs seeds and seedlings among schools. Second, are seeds collected from local farmers particularly from Indigenous Peoples or *Lumad* with seeds saved from generations. Government agencies like the Department of Agriculture (DA), Department of Environment and Natural Resources (DENR); and organizations like IIRR, cooperatives, East West Seed Foundation, Gawad Kalinga Farmers, with initiatives on seed distribution are also sources of planting materials for the schools. Some teachers also mentioned buying seeds from the local agricultural stores.

There is no direct link between schools and the country's formal Plant Genetic Resources (PGR) sector yet, but the potential to establish linkages with both the formal and informal PGR should be explored. Formal PGR institutions such as the National Plant Genetic Resources Laboratory in the University of the Philippines Los Baños can collaborate with schools on research projects that aim to conserve and utilize plant genetic resources. This can help schools introduce new crop varieties into their school gardens, improve the genetic diversity of their gardens, and develop new crop varieties that are adapted to local growing conditions and resilient to climate change. Further, the formal PGR sector can provide guidance on how to conserve plant genetic resources in school gardens, including best practices for seed saving and storage.

Schools can contribute to local seed banks which can also be used by formal PGR laboratories for conservation and research purposes. The formal PGR sector can also aid in the proper identification of collected cultivars of the schools and track distribution of endangered crop species in some localities. This can help preserve rare or endangered plant varieties and ensure their availability for future generations (Plucknett et al., 1987; Lamola, 1992). Overall, by strengthening the link between schools and the formal and informal PGR sectors- especially by enabling the exchange of seeds between them- schools can access a wider variety of crops

and enhance the diversity of the fruits and vegetables served in school canteens and feeding programs.

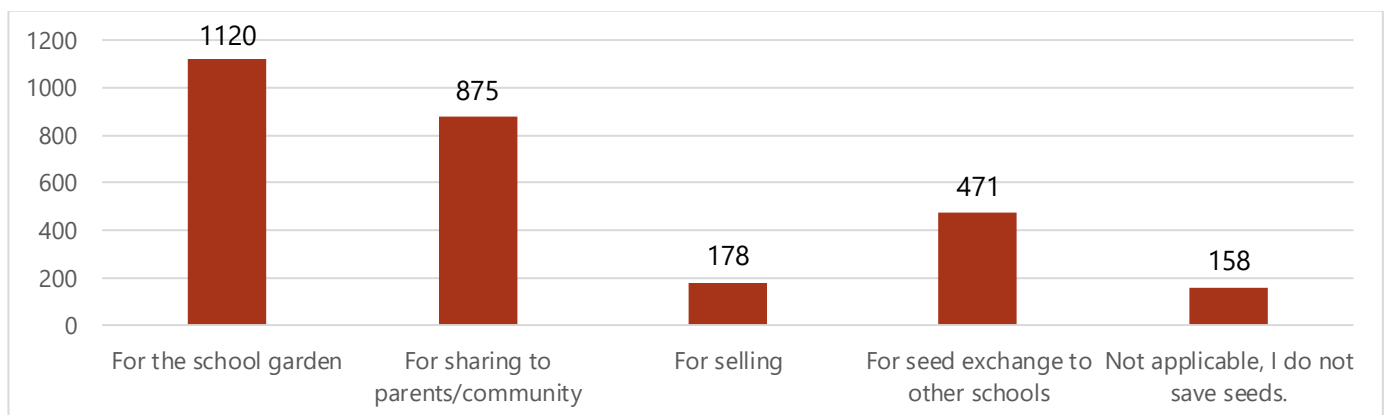
Figure 9: Source of planting materials for TIFVs



3.5 Distribution and Utilization of Traditional and Indigenous Fruits and Vegetables

Lighthouse Schools and Crop Museums utilize and distribute saved seeds to sustain school gardens and to share with parents and community members. This substantiates the reasons for saving seeds as shown in Figure 10. Seeds are also utilized during seed exchange events with other schools, and some schools generate income from selling their seeds.

Figure 10: Utilization and distribution of saved seeds for the past 3 years

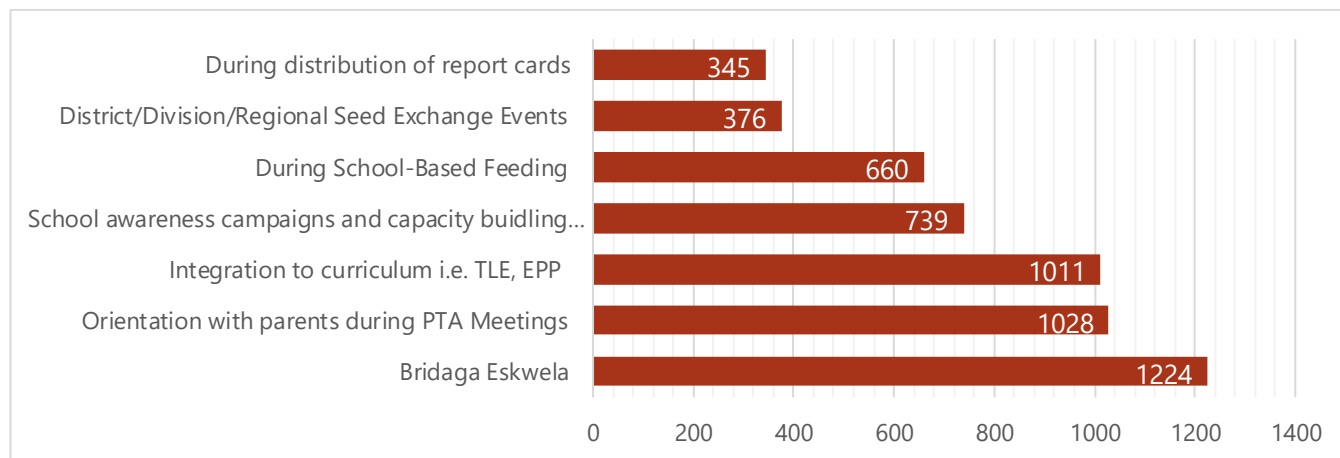


3.5.1 Seed Distribution Mechanisms

School activities to promote greater production and consumption of TIFVs, include the distribution of seeds and seedlings. As seen in Figure 11, most schools indicate that seed distribution is commonly done during the *Brigada Eskwela*, at the onset of the school year when school gardens are being restored. Another seed distribution activity is usually undertaken during the Parents-Teachers-Association (PTA) meetings that are scheduled every quarter, along with the distribution of report cards. Seed distribution is also integrated in EPP (*Edukasyong Pantahanan at Pangkabuhayan*) and TLE (Technology and Livelihood Education) subjects where schools distribute planting materials to students and promote the establishment of home gardens.

Further, seed distribution is incorporated in the school-based feeding program in which parents, volunteers and students who want to grow vegetables at home are given seeds and seedlings. Seeds are also shared during home visits to undernourished students who need assistance at home. Most school outreach programs (i.e., learning visits, seed exchange events with other schools, community planteries, local festivals) and capacity building activities (i.e., seminars on food preparations, campaigns on home gardening) include the distribution of seeds and seedlings to the community.

Figure 11: Mechanisms for seed distribution



3.5.2 Scope of Seed Distribution by Schools

Results from the online survey show that both the Lighthouse Schools (LSs) and Crop Museums (CMs) incorporate seed saving and seed distribution into school activities. Most of the CMs stated the provision of seeds and seedlings to 30 individuals or less, while a quarter of the respondents from LSs have provided seeds and seedlings to more than 95 individuals for the past three years (See Table 8). During the COVID-19 pandemic and subsequent school closures and school garden abandonment, fewer seeds were distributed to individuals.

Table 8: Average number of individuals given with seeds and seedlings for the past 3 years

	Students	Parents & Community
Above 95	240	216
76-95	54	58
56-75	84	89
31-55	206	206
Below 30	530	545

3.6 Factors Influencing the Selection of Traditional and Indigenous Fruits and Vegetables for Conservation, Promotion and Utilization by Schools

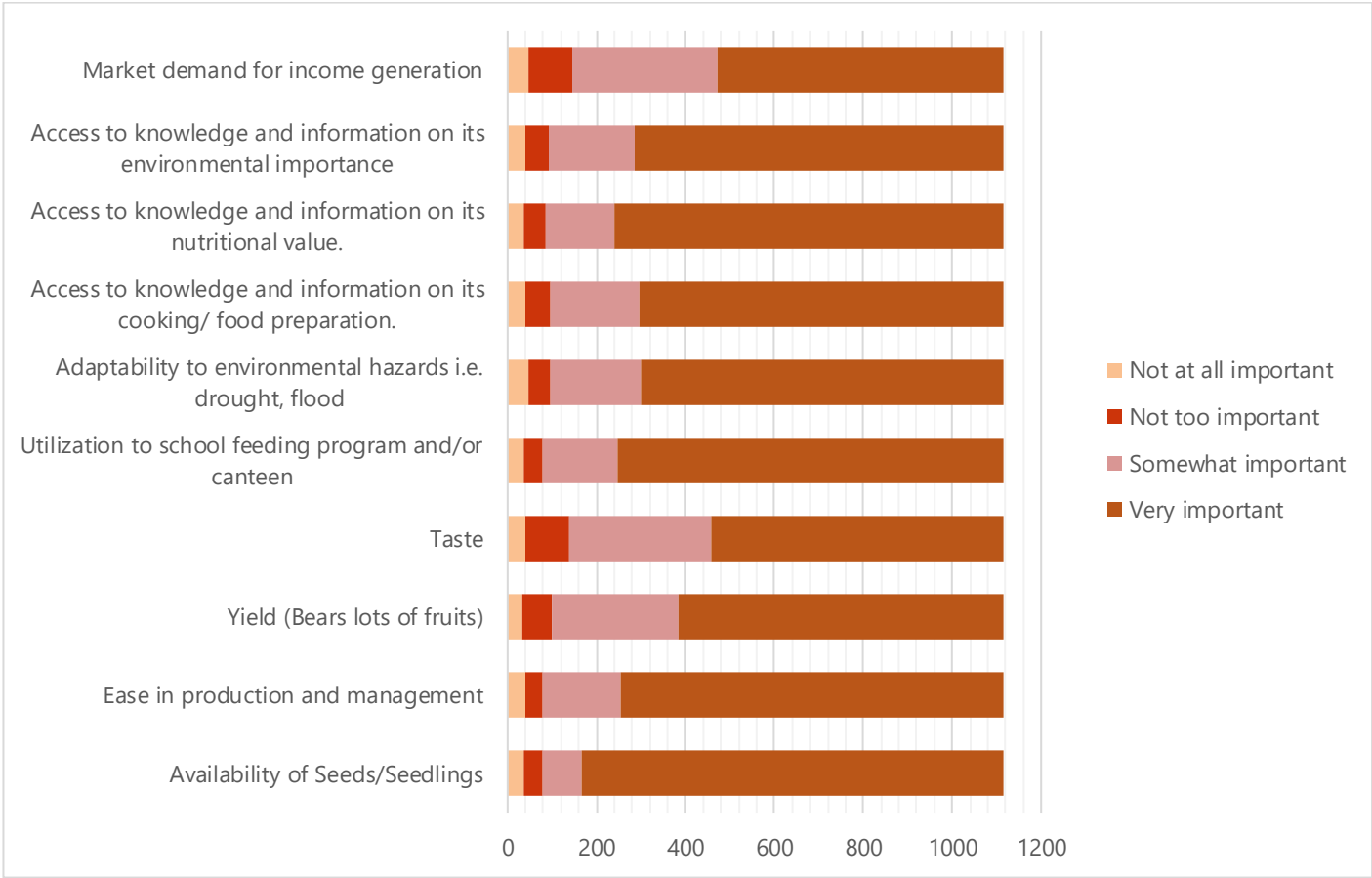
The selection of fruits and vegetables in schools for conservation, utilization and promotion should be based on factors that ensure they are nutritious, safe, locally available, culturally accepted, and appealing to students. By considering such factors, school feeding programs can provide nutritious and culturally appropriate meals that promote children's health and well-being (FAO, 2018; Hunter et al. 2020).

Online survey respondents largely considered the availability of seeds and seedlings as a 'Very Important' factor for the conservation and promotion of traditional and indigenous fruits and vegetables (TIFVs) by schools (See Figure 12). Second, in order of importance, was access to knowledge and information on the crop's nutritional value by schoolteachers. Third, was the use of TIFVs in school feeding and canteens; and fourth was the ease of production and management (i.e., less inputs required for plant growth and well-adapted to environmental stresses). Respondents largely considered market demand and taste (acceptability to students) only as 'Somewhat Important'.

During the online conference, schoolteachers suggested improving the seed availability of the following fruits and vegetables: Sweet potato (*Ipomoea batatas*), taro (*Colocasia esculenta*), moringa (*Moringa oleifera*), amaranth (*Amaranthus spp.*), Malabar nightshade (*Basella rubra*), jute mallow (*Corchorus olitorius*), cowpea (*Vigna unguiculata subsp. unguiculata*), mung bean (*Vigna radiata*), winged bean (*Psophocarpus tetragonolobus*), hyacinth bean (*Lablab purpureus*) and fruit trees like papaya (*Carica papaya*), and banana (*Musa spp.*). Improving the availability of the seeds of nutrient-dense and climate-resilient TIFVs that are already utilized in school-

based feeding programs (some of which have been mentioned previously) is one option to support TIFV conservation and promotion by schools.

Figure 12: Factors affecting the selection of TIFVs for conservation and promotion by the schools



3.6.1 School Recommendations to Better Promote TIFVs

The conservation and promotion of TIFVs in the Lighthouse Schools and Crop Museums has been in place for over three years since the IIRR introduced the ISNM to DepEd in 2016 (through a program supported by Canada' International Development Research Centre). As discussed previously, seed saving, seed distribution, integration into school curriculum and outreach programs are present in schools but need strengthening and continued support from the DepEd, other government agencies such as DA, DENR, DOST-FNRI, and local/international organizations with similar initiatives. During the online conference, school teachers shared some recommendations to better promote TIFVs in schools and communities as shown in Table 9.

Table 9: Recommendations from schoolteachers to better promote TIFVs in schools and communities

1. Strengthen awareness campaigns and capacity building activities on the conservation and utilization of TIFVs

- Benchmarking activities (e.g., through Lighthouse Schools, seed exchanges)
- Contests/Competitions (e.g., recipe making & cooking contests; food fairs)
- Cooking demonstrations utilizing TIFVs (both on- site and online or digital platforms)
- Regular storytelling activities on nutritious foods and vegetables during flag ceremonies
- Intensive information dissemination, training on proper virtual seed examination techniques, reproduction, and preservation, etc.
- Home and *Purok*⁸ visits in *Barangays*⁹ to encourage planting of TIFVs; coordinate with Local Government Units (LGUs) to promote TIFVs in the locality & community; multisectoral integration and implementation (i.e., education, government, community, private, etc.)
- Awareness campaigns on advantages and nutritional benefits of TIFVs
- Orientations for parents and learners (e.g., constant integration in regular school activities such as Honors day and PTA meetings)
- Advocating to famous chef and influencers to include TIFVs recipes in their National TV appearances
- Provision of seeds and seedlings of TIFVs, and other planting materials

2. Develop and distribute Information, Education and Communication (IEC) materials on the value, conservation, and utilization of TIFVs

- Feature TIFVs in recipe books- including their cooking preparations; seed gathering, handling, and distribution
- TIFVs trivia posters, brochures and flyers
- Develop audiovisual/multimedia IEC materials (e.g., videos, infographics) to be distributed to schools for use

3. Utilize social media & digital platforms for TIFVs promotion

- Social media platforms (e.g., Facebook, Instagram etc.)
- TV advertisements

4. Allocate and secure additional funds for TIFVs promotion

- Add to Annual Improvement Plan (AIP) and School Improvement Plan (SIP) of schools
- Provide financial support to non-Lighthouse Schools to scale out their practices

5. Better integrate TIFVs into school curriculums

- Integrate agrobiodiversity into Health, Science, *Edukasyon sa Pagpapakatao at Pangkabuyan* (EPP) and Technology and Livelihood (TLE) subjects

⁸ An informal division within a barangay in the Philippines.

⁹ The lowest political administrative unit of the Philippine government.

6. Strengthen policy support for TIFVs

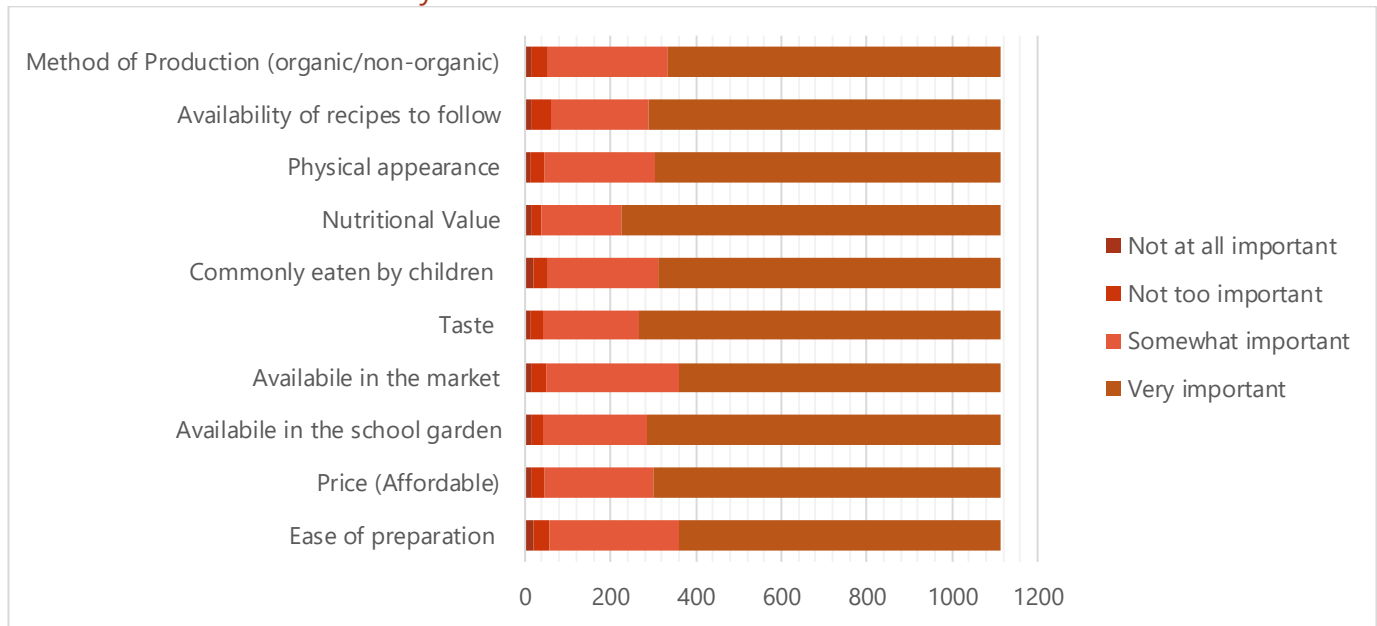
- Promote Food Policy Councils
- Add to School-Based Feeding Program (SBFP) guidelines
- Concrete guidelines for implementing the Integrated School Nutrition Model (ISNM), making it easier to identify entry points for internal and external stakeholder support
- Utilize TIFVs in school canteens and in Menus for SBFPs
- Institutionalization of and policy support for the ISNM program
- Continuous identification and expansion of ISNM Lighthouse Schools- particularly into private schools.

3.6.2 School Recommendations to Improve TIFVs Utilization

As seen in Figure 13, nutritional value, taste, availability in the school garden, and availability of recipes to follow were largely considered *Very Important* factors influencing the selection of TIFVs to utilize in school feeding and canteens. Meanwhile, largely considered *Somewhat Important* were market availability, ease of preparation (cooking), and whether the TIFVs were organic.

Fruits and vegetables identified by schoolteachers as nutrient-dense and recommended for improved utilization in schools included: drumstick tree leaves, water spinach or *kangkong* (*Ipomoea aquatica*), and amaranth for leafy vegetables; string beans and mung beans among legumes; okra, tomato (*Solanum lycopersicum and spp.*), and eggplant (*Solanum melongena and spp.*) for fruit vegetables; and sweet potato among root crops. To ensure that TIFVs are grown and used in school meals and school canteens, there should be year-round availability and access to these vegetables in the school gardens and markets, along with access to information on how to cook them.

Figure 13: Factors Influencing the Selection of Traditional and Indigenous Fruits and Vegetables for Conservation and Utilization by Schools



3. Conclusions

Schools can play a crucial role in promoting agrobiodiversity conservation among students and in the wider community. By conserving agrobiodiversity in school gardens, teachers can educate students and the community on the importance of traditional and indigenous fruits and vegetables for food security and nutrition- particularly to prevent malnutrition among schoolchildren.

Lighthouse Schools (LSs) and associated Crop Museums (CMs) have been in operation for over 5 years and are proving very effective in promoting biodiverse garden systems, conservation, and availability of cultivars of traditional and locally adapted vegetables. Given their size, the LSs and CMs can easily be used to experiment with and promote sustainable agriculture practices, such as crop rotation, intercropping, and companion planting, to promote both inter-species and intra-species diversity. They also foster dietary diversity and have proven to improve consumption of nutrient-dense vegetables in schools and nearby communities.

Access to and availability of seeds, information and education materials influences the type of traditional and indigenous crops that schools conserve, promote and utilize in school feeding. These schools typically conserve at least 5 crop types, but this number can go well beyond 12. Sweet potato, taro, moringa, amaranth, Malabar nightshade, jute, string beans, cowpea, mungbean, winged bean, hyacinth bean, papaya, and banana are the most grown and utilized crops. Some traditional and indigenous leafy vegetables like Lupo (*Alternanthera sessilis*), Himbabao (*Broussonetia luzonica*), and Pako (*Diplazium esculentum*) are only grown and consumed in regions where it is associated with local food heritage and culture.

LSs and CMs also organize seed exchanges and seed collection missions between schools, District, and Division Offices supported by memoranda. By exchanging seeds, schools can access a wider variety of crops, which can help to enhance diversity of the fruits and vegetables served in school canteens and feeding programs. Through the provision of seed diversity kits and seed exchange events students, teachers and the wider community are now valuing the need for conserving agrobiodiversity while also promoting their sustainable use via techniques such as bio-intensive and regenerative agriculture practices.

Having delivered multiple benefits for agrobiodiversity conservation since their introduction, LSs and CMs show great potential as scaling mechanisms to expand the conservation, promotion and utilization of traditional and indigenous fruits and vegetables. However, more needs to be done to ensure they can significantly contribute to sustainable agricultural practices and the preservation of agrobiodiversity for future generations.

5. Recommendations

The following are recommendations to leverage opportunities presented by the network of Lighthouse Schools (LSs) and associated Crop Museums (CMs) for agrobiodiversity conservation:

- 1. Improve distribution of seeds and seedlings of nutrient-dense traditional and indigenous fruits and vegetables (TIFVs).** Nutrient-dense local plant varieties that are at risk of disappearing can be promoted for conservation by enhancing the availability of and access to planting materials. Seeds of crop cultivars that are nutritious, culturally accepted, locally available and climate resilient must be prioritized when determining the types of crop varieties to promote. The distribution of seed diversity kits with small amounts of diverse range of crop cultivars (at least 10 types) will promote the use of local and traditional crops and increase access to diverse crops and varieties. Seed distribution and promotion to communities can be incorporated into school programs such as *Brigada Eskwela*, nutrition month activities, and PTA orientation. In addition, intensive profiling and mapping of school's crop diversity can be used to locate local school sources of underutilized crop cultivars that can be promoted widely to other schools.
- 2. Develop and distribute informational material to enable the inclusion of priority TIFVs in School- Based Feeding Program menus.** Traditional and indigenous crops are often underutilized because of the limited information available on their nutritional value and cooking preparations. Simple and practical Information, Education, and Communication (IEC) materials on cooking, the nutritional value, propagation, and conservation practices of prioritized TIFVs need to be developed and distributed to schools. These can be in the form of modules, videos, infographics, brochures, crop labels in gardens, and trivia posters that can be incorporated in school curricula, posted on school bulletin boards where students

can read and see, or distributed to students' parents. In addition, one of the factors influencing the selection of TIFVs for school utilization is the availability of recipes that the school teachers can follow. Availability of recipe booklets with standardized recipes that SBFP coordinators can serve in school feeding will be helpful to promote utilization of such crops.

3. Promote the integration of agrobiodiversity into school curricula.

Agrobiodiversity in education needs to be included in subjects like Health, Science, EPP (*Edukasyong Pantahanan at Pangkabuhayan*) and TLE (Technology and Livelihood Education). Mainstreaming key issues on agrobiodiversity in education will enhance student awareness of the importance of conserving these species for their ecosystem functions, beyond food provision and for their potential role as a livelihood option. It could also encourage them to become stewards of agrobiodiversity. The mainstreaming, or integration, of agrobiodiversity in education programs is currently constrained by a number of institutional issues including the re-orientation of academic staff to facilitate agrobiodiversity learning. The lack of human capacity and expertise in agrobiodiversity among teaching staff and the tendency to emphasize teaching rather than facilitate learning is an issue for the effective mainstreaming of agrobiodiversity into education (Rudebjer et al., 2011).

4. Institutionalize diversity fairs, seed exchange events and other conservation initiatives within DepEd programs.

The network of LSs and CMs have proven successful in terms of organizing events that contribute to preserving genetic diversity, enhancing food security and nutrition, and empowering local communities. Seed saving is already practiced in schools with the objective of growing plant cultivars with best qualities and to ensure the availability of local varieties of seeds for future planting and for use during emergencies or disasters. Seed exchange and other conservation programs, while existing, can be better organized as an annual activity where schools can gain access to a wider variety of crops from other schools. Seed exchanges can also be improved to build on the transfer of local knowledge between educators and local communities, building solidarity around the preservation of traditional crop cultivars. To have maximum impact, seed exchange events must feature the use of these crops through food preparation and tasting events.

5. Boost collaboration with multi-sectoral stakeholders for awareness campaigns.

Collaboration with formal and informal sectors, through on-site or online platforms, for the conservation and promotion of agrobiodiversity is highly encouraged. These include learning visits or field trips to a LS or CM, seed exchange events, food fairs, workshops and cooking competitions between schools using traditional crops, as well as showcasing best practices on the cultivation and consumption of diverse range of crop varieties. Such activities, if implemented with the Local Government Units, private sectors, local farmers association, formal Plant Genetic Resources institutions, developmental organization, famous chefs, and youth advocates, can create awareness and garner multi-sectoral support for collective action.

6. Establish links with formal and informal Plant Genetic Resources (PGR)

institutions. PGR institutions can help schools introduce new crop varieties and improve the genetic diversity of school gardens. Researchers from formal PGR institutions can provide technical support, while local farmers can share their knowledge on the production and uses of the traditional crop varieties. As a result, LSs and CMs will receive holistic guidance on how to conserve plant genetic resources in school gardens, including best practices for seed saving and storage. Ultimately, by working together, schools and PGR networks can exchange knowledge and resources, promote biodiversity conservation, and help build stronger relationships within the community.

7. Strengthen policy guidelines and fund appropriation.

Lighthouse Schools receive 20,000 pesos (USD 358) annually for the improvement of school gardens supporting school-based feeding programs and to strengthen nutrition education activities including the development of IEC materials. Such funds are not accessible to other non-Lighthouse Schools. However, at the school level, fund allocation for conservation and promotion of TIFVs and nutrition promotion activities is possible if identified in the school's Annual Improvement Plan (AIP) and School Improvement Plan (SIP). Allocation of funding support (along with complimentary guidelines) must be sustained to allow schools to continue their conservation programs. Joint memorandums from various government agencies and institutions should be considered to ensure that there is an integrated and holistic approach to promoting agrobiodiversity in schools, educating young generations to become stewards of traditional and indigenous plant genetic resources.

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