IMPROVING FOOD AND NUTRITION SECURITY THROUGH SCHOOL INTERVENTIONS

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Research organizations involved in the study

International Institute of Rural Reconstruction (IIRR)
Km. 39 E. Aguinaldo Highway, Biga II, Silang
Cavite 4118, Philippines

Department of Education (DepEd)
Meralco Ave, Pasig, Metro Manila, Philippines

Food and Nutrition Research Institute-Department of Science and Technology (FNRI-DOST)
FNRI Bldg., DOST Compound, Gen. Santos Ave.
Bicutan, Taguig City
Metro Manila, Philippines

Location of the study: Region 4A, Philippines

Primary Investigators:

Emilita Monville Oro, RN, MPH
Country Director
Philippine Program
International Institute of Rural Reconstruction

Dr. Imelda Angeles-Agdeppa, PhD
Assistant Scientist
Food and Nutrition Research Institute
Department of Science and Technology

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Executive summary

A recent national nutrition survey (2013) undertaken by the Food and Nutrition Research Institute (FNRI-DOST) in the Philippines has revealed that the prevalence of underweight children between 5-10 years of age is higher (29.1%) than in other age groups. With regards to stunting, although there has been an improvement since the last survey in 2011, it is still at 29.9%. The rate of wasting is at 8.6% (which is about the same in 2011 at 8.5%). This demonstrates that there is a significant public health problem. Fortunately, this situation has in recent years been brought to the attention of the country’s planners, policy makers, and legislators.

School-based nutrition programs have been developed as one response to address this problem. School-based nutrition program in the Philippines has included supplementary feeding for undernourished school children, universal deworming and promotion of hand washing, and school gardening. Conventionally, these programs are implemented in a unilateral manner, thereby making the complementation of these interventions limited. In an attempt to demonstrate the value of linking these interventions, an integrated model was developed and tested during the phase 1 of a research project implemented in 2012 to 2015 with the support of IDRC. This initiative, referred to as the Integrated School Nutrition Model, was designed to link school gardens, supplementary feeding, and nutrition education. Conveniently referred to by its acronym (GarNESup), this program builds on existing nutrition interventions of the Department of Education (DepEd), putting a special emphasis on sustainability and synergy of programs. Supplementary feeding included use of iron-fortified rice which provided an additional 0.6 mg of iron per cup of cooked rice and chemical free, indigenous vegetables from school gardens. To improve the consumption and acceptance of indigenous vegetables, standardized recipes of indigenous vegetables were developed and used in the feeding program. The school gardens were enhanced with agro-ecological technologies such as the bio-intensive gardening to improve productivity and sustainability. Nutrition education was delivered via different modalities to children and caregivers to foster healthy eating habits of children both at school and at home. During this phase, different methods to link the various nutrition-related programs were implemented resulting in improved nutritional status of children as well as improved knowledge, attitude, and practice of both children and their parents.

This present study (Phase 2) involves a 28-month action research project aimed to institutionalize and scale up the Integrated School Nutrition Model to improve nutritional awareness and status of school-age children in the Philippines. This project helped deepen the understanding and operationalization of the integrated model. Implementation guidelines were developed to serve as manual of operation for schools. The scaling up relied largely on establishing a critical mass of schools termed as “lighthouse schools” (LS), which provided local research evidence while demonstrating scalability of the model. Fifty-eight (58) LS were designated in Region IVA where a total of 80,222 children were enrolled in 2016-2017. These LS are expected to influence the rest of 2,691 public elementary schools in the region with a total population of around 1,760,000 school children. From the list of LS, three schools were selected to serve as sentinel research sites (in Cavite province). Rigorous collection of qualitative and quantitative data was undertaken. Further adaptation of the model was undertaken and the processes and findings were documented. In the wider sample of school, the integrated model
was adopted and implemented at the schools’ own pace of implementation, with minimal supervision and technical assistance. A heavy reliance on survey forms and questionnaires were featured in these 55 LS to support data collection needs. For the study on effects of supplementary feeding, FNRI-DOST verified the nutritional assessments in three sentinel schools and three LS from July to August 2016.

Better integration of school gardens, school feeding, and nutrition education was achieved as shown by the utilization of garden produce (42%) in the feeding program, use of gardens in four learning areas, and implementation of nutrition education activities in five platforms. Mechanisms and strategies for effective integration and sustained implementation of gardens, supplementary feeding, and nutrition education were identified. Bio-intensive garden techniques are known to help regenerate the soil and replenish its capacity to grow healthy crops as confirmed by the soil tests undertaken in the three sentinel research schools. The test showed that there are high amounts of nitrogen, phosphorus, and organic matter in gardens that employed bio-intensive gardening practices. The productivity data of a 200 sq. meter school garden area was gathered over the duration of the action research. Continuous and intensive promotion of indigenous vegetables varieties and substantial seed distribution efforts (via diversity kits) contributed in achieving garden diversity in LS. The role of agro biodiversity conservation in supporting school nutrition was reaffirmed. Majority of the schools were able to deliver nutrition education (NE) activities. The most widely used mode of NE is the participatory NE activities for community and parents (83.64%), followed by NE during feeding (74.55%), nutrition integration in lessons and NE during Parent-Teacher Association meetings and conferences (67.27%), and garden-based nutrition-education (65.45%). The developed recipes and *Moringa*-based recipes were combined to complete the 20 cycle menu in 3 sentinel schools. Iron-fortified rice was used in the 3 sentinel schools (procured directly from the supplier). Results of a 120 day feeding cycle showed that there was a significant decrease in the proportion of undernourished students aged 5.1-10 and 10.1-19 y.o. from baseline (100%) to endpoint (64.71%).

To determine if there exist further additional benefits in extending the feeding period to an additional 80 days (during the 2 and half months school break), the sentinel schools continued feeding the children. Each school used different strategies to convene children at the school during school break. One hundred ninety-five (195) out of 277 students participated in the additional 80 feeding days, with a compliance rate ranging from 50 to 60 days. Results revealed that there was a further significant increase in the mean weight and height of the students at end of the 80 feeding days in both age groups and gender (p>0.05).

A multi-scalar approach was used to *bring to scale* the Integrated School Nutrition Model. The first pathway was a horizontal scaling effort, which involved a network of lighthouse schools (LS) within a single region. These LS were designated as learning hubs, action-research sites, seed propagation centers, and demonstration sites. The second pathway was a vertical scaling, which aimed at influencing relevant national agencies and policymakers through theme presentations and related dialogue processes. Various mechanisms such as formation of project implementation teams at the division (provincial) level and technical working groups at the school level were developed and tested. The development of guidelines was undertaken, coupled with capacity building to support implementation and establish evidence. Continuous advocacy and promotion using evidence generated led to scaling out of the model across 16 regions in the
The research problem

In the recent national nutrition survey (2013), it was revealed that underweight prevalence among school children 5-10.0 years of age is higher (29.1%) than in any other age group. For stunting, although there’s an improvement since the last survey in 2011, it is still at 29.9% and wasting is at 8.6%, which is about the same in 2011 at 8.5%. Clearly, this is a reason for concern but fortunately, this situation has, in recent years, been brought to the attention of the country’s planners, policy makers, and legislators. Nutrition-related programs in schools are typically implemented independent of each other, thus, the complementation of these interventions has been limited. In an attempt to link these interventions, an integrated model was developed and tested through the phase 1 research project. The model integrated school gardening, school feeding, and nutrition education. Ways to bridge the various nutrition-related programs were implemented, which resulted to positive nutrition outcomes.

Despite the positive results generated in phase 1, operational issues remained. Phase 1 demonstrated that gardens can rely primarily on the school’s internal resources using bio-intensive systems and absolutely no chemical inputs. It was also recommended in phase 1 that adaptive research be undertaken to find ways to enhance garden sustainability, including ways to better protect the gardens from natural disasters and impacts of climate change. The use of iron-fortified rice in school feeding was constrained by a lack of regular supply (special arrangements have to be made with a supplier). Refinement and enforcement of the supplementary feeding guidelines for undernourished (wasted and severely wasted) children are warranted even before the potential of gardens to support school feeding program was maximized. Sustainability of nutrition education in schools for both parents and children remains a challenge in terms of time (of teachers handling the nutrition sessions and parents attending the sessions) and capacities (technical and materials). There is a need to explore further entry points within existing DepEd school activities (i.e. nutrition month, parents meetings, and curriculum adjustment to integrate nutrition education). Strategies to sustain the model and its outcomes need to be explored and
studied further i.e partnership with the local government units and the private sector. Although a number of ways to sustain these school-based interventions were identified in phase 1, these need to be tested and enhanced prior to scaling up. Moreover, it is crucial to identify the different mechanisms that could facilitate the institutionalization of the model at various levels within DepEd as well as pathways for scaling up: the role of school gardens and feeding activities in influencing knowledge and attitude of children and parents; how sustainable nutrition education can be; and ways to efficiently implement and sustain the feeding activities in schools through partnership building involving bigger number of schools.

Research results on the gardening aspect can strengthen food production programs in the Philippines and elsewhere. School garden outputs using ecological approaches and its contribution to nutrition and awareness building were determined and can be used to draw out support for gardening program in schools and communities. Outcomes of extended school-based feeding program linked to gardens and nutrition education can be used for programming and policy making. Nutrition education activities identified as doable and sustainable can be used as basis for guideline development.

**Progress towards milestones (3 page max)**

<table>
<thead>
<tr>
<th>Changes in nutritional status after the second cycle of supplementary feeding in lighthouse schools documented and shared</th>
</tr>
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<tbody>
<tr>
<td>o 100 % completed (Annex 1. Result of 120 and 80 days feeding)</td>
</tr>
<tr>
<td>- The first cycle feeding program, which is also the regular DepEd-funded 120-day feeding program, was completed in September 2016 to February 2017. The additional 80-day feeding funded by the project commenced in March 2017 to July 2017. Nutritional status of children was assessed after the additional 80 days feeding was done. There were 195 out of 277 students who participated in the additional 80 feeding days. Recommendations were crafted based on the results and were shared with DepEd and policy makers.</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Sustained Cavite-wide (province-wide) bio-intensive nutrition gardens established and supplied fresh, nutritious vegetables to school feeding program</th>
</tr>
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<tr>
<td>o 100 % completed (Annex 2. Status of BIG adoption in Cavite)</td>
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<table>
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<tr>
<th>Effective lighthouse schools in Cavite and other provinces in region IV-A serving as learning centers for implementing integrated school-based nutrition program</th>
</tr>
</thead>
<tbody>
<tr>
<td>o 100 % completed (Annex 3. Achievements of Lighthouse Schools)</td>
</tr>
<tr>
<td>- Fifty-eight lighthouse schools and 237 crop museums established in Region IV-A serving as learning venue for schools and communities. Teacher-to-teacher training, distributions of planting materials, and seed exchanges were held in these lighthouse schools and crop museums. A total of 1598 schools out of the 2732 schools in Region IVA were directly trained by LS during the project period and 626 parents were reached via distribution of planting materials.</td>
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</tbody>
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<tr>
<th>Report of research results and research articles submitted to journals</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ Working papers were developed and can be translated into journal manuscript for future</td>
</tr>
</tbody>
</table>
Two research manuscripts from phase 1 were submitted to Maternal and Child Nutrition Journal and Philippine Journal of Science (Annex 7. Manuscripts Submitted)

Media briefing packages prepared and distributed during media field event(s)

- A media brief and project kit shared with 9 media personnel that were engaged during the project period. About 9 articles were written about the project:

Writeshop to derive and document knowledge products (good practices in gardening, food education, nutrition and environmental awareness interventions)

- Two primers produced on bio intensive gardening and crop museum (Annex 9. Primers)
- Nutrition education modules revised; handouts developed (see Annex 10. Revised nutrition education modules)
- Posters on school-based feeding program, indigenous vegetables (Annex 11. Posters on school-based feeding and indigenous vegetables)
- Six case stories developed by members of project implementation team towards the end of the project (Annex 12. Case stories)
- Nutrition education activities compiled and shared (Annex 13. Consolidated)
## Nutrition Education Activities

Policy recommendations disseminated through a national conference for key stakeholders, planners, policy makers and other decision makers

- **100% completed**
  - Assessment results of the school-based supplementary feeding program shared with DepEd program planners and implementers (*Annex 14. Leveraging Schools as Platforms for Effective Nutrition Interventions: School-Based Feeding Programs*)
  - Key messages for policy and planning consideration and research briefs developed (*Annex 15. Policy recommendations*)
  - Two key activities targeted to key stakeholders, policy makers, and Department of Education program planners conducted
    - School nutrition forum was held towards the end of the project attended by 150 participants (*Annex 16. School nutrition conference activity report*)
    - Policy forum was conducted to engaged policy makers and the national nutrition council governing board members (*Annex 17: Policy forum on school nutrition activity report*)

## Synthesis of research results and development outcomes

The integrated school nutrition model (GarNeSup), which links 3 related programs, was developed capitalizing on the potential of schools as platform to address food and nutrition challenges. (i) School gardens were enhanced with agro-ecological technologies such as the bio-intensive gardening to improve garden productivity and sustainability. (ii) Supplementary feeding with iron-fortified rice and indigenous vegetables from school gardens was provided to identified malnourished (wasted and severely wasted) students. Recipes with indigenous vegetables were developed and used. (iii) Nutrition education methodologies for children and caregivers were tested and adapted. The model was developed through an action research project (phase 1) implemented in 2012 to 2015 in a single province with IDRC’s support. The model builds on existing nutrition interventions of the Department of Education (DepEd), such as the school-based supplementary feeding program (SBFP) and Gulayan sa Paaralan (GPP) or school gardening program with emphasis on sustainability and synergy of programs. Nutrition education was initially identified as a missing link. The study has revealed the effectiveness of the integrated model in improving the nutritional status of children; improving the knowledge, attitude, and practice of both children and parents; sustaining the implementation of bio-intensive nutrition gardens and crop museums that aim to retrieve and conserve crop cultivars while improving year-round availability of a diverse range of climate-resilient, locally adapted, and nutritionally important vegetables.

The subsequent phase is a 28-month action research project aimed to institutionalize and scale up a sustainable, holistic, gender-sensitive, and integrated school nutrition model to improve nutritional awareness and status of school-age children in the Philippines. The scaling up relied largely on a critical mass of schools also known as “lighthouse schools” (LS) to demonstrate the model on a wider-scale whilst also generating data and training other schools. Fifty-eight (58) LS were designated in Region IVA where a total of 80, 222 children were enrolled in school year
2016-2017. These LS are expected to influence the rest of the 2691 public elementary schools in the region that has a total population of around 1,760,000 school children.

Three sentinel research schools in Cavite Province were selected through purposive sampling from the wider pool of LS where rigorous data collection and further adaptation of the model was done. Qualitative and quantitative data was collected in 3 sentinel schools and in 55 LS. Survey forms and questionnaires were developed and distributed to teachers at the start and end of the project to support data collection. All LS schools undertook nutritional assessments of Kinder to Grade 6 children during the first 3 weeks of classes following DepEd Memorandum No. s. 2016. All children enrolled in the schools were weighed and their height was measured to determine their nutritional status. This data was used to verify and validate whether they still need to receive the supplementary feeding for the current year. Normally, the basis of DepEd in computing the fund allocation for supplementary feeding per school is the data on weights of children taken before school ends in March. Hence, there is a need for them to update their data during school entry to identify the true feeding beneficiaries. For the study, FNRI-DOST verified the nutritional assessments in three sentinel schools and three LH schools from July to August 2016. Weight was measured using a calibrated digital double window weighing scale (SECA) recorded to the nearest 0.1 kg. Students wore light clothing, their footwear removed, and pockets emptied. Height was measured using a stadiometer (SECA) recorded to the nearest 0.1 cm.

The partnership of International Institute of Rural Reconstruction (IIRR), DepEd, and the Food and Nutrition Research Institute - Department of Science and Technology (FNRI-DOST) resulted to the institutionalization and scaling up of an integrated nutrition model. The following are the achieved results:

**Objective 1: To fine-tune the implementation of an integrated school nutrition model in the Philippines**

Fine-tuning focused on the identification of strategies and mechanisms for effective integration and sustained implementation of gardens, supplementary feeding, and nutrition education and development of evidence-base recommendations. A careful study was undertaken to better understand the functional and structural challenges reported by school staff in the previous research project (phase 1). Implementation guidelines were developed, which facilitated uptake and served as manual of operations for schools.

Bio-intensive gardening (BIG) approach has evolved as being not only nutrition-smart but also climate-smart. The approach was introduced into the school system as a response to sustainability and functionality issues. In phase 1, the approach was translated into BIG standards for schools, which outline practices and principles (Annex 18. Bio intensive Gardening Standards for Schools). The garden standard was enhanced by elaborating concepts of climate and nutrient smart gardens, nutrition-sensitive agriculture, and its link to feeding and learning. A simple crop planning tool that takes into consideration feeding center requirements was developed and introduced to schools.

For supplementary feeding, DepEd’s implementation guideline was enhanced by integrating concepts and principles learned in phase 1. The promotion of iron-fortified rice and the 15
recipes with indigenous vegetables were supplemented by developed iron-rich recipes for areas or cases where iron fortified rice is not available due to some reasons (no delivery because of floods, typhoons, etc). A 200-day feeding was implemented in 3 schools to demonstrate the value of year round school feeding, to examine and address implementation issues, and to study more carefully how gardens can contribute to dietary diversification in the feeding program.

The nutrition education strategies were classified as formal and non-formal. Formal nutrition education i.e. use nutrition sensitive lesson plans, nutri-home connection, and using gardens for learning are strategies that target school children and are meant to be delivered in the classroom. Meanwhile, non-formal nutrition education targets the community or parents. These include nutrition education sessions, participatory activities such as cooking demonstration, recipe development, and use of information, education and communication materials. Different forms of information, education, and communication materials were developed to promote key nutrition and gardening messages. Teachers were provided with simplified reference materials (nutrition modules) and teaching aid to help them better incorporate nutrition topics into their daily lesson plans and to hold short sessions with parents during their regular parent-teacher meetings.

**Mechanisms Identified to Establish Strong Links of Programs**

**School Garden - School Feeding Link**

Better integration of school gardens and school feeding was achieved during this research endeavor. The following mechanisms were identified as facilitating factors to better linkage: familiarization of school feeding menu by garden coordinators; garden planning with consideration to feeding cycle menu; year round garden diversity; incorporation of the recipes with indigenous vegetables into the 20-day cycle menu of schools; effective coordination of garden coordinator and school feeding coordinator; and sustained technical support from division school health personnel.

Fifty-six (56) schools confirmed garden produce were utilized in the school-based feeding program. In the twenty-one (21) LS with complete data, it was found that 42% of the total garden produce was used in SBFP, 24% was distributed for free to parent volunteers, students, and teachers who helped out in garden activities, 17% was given to the school canteen, and 17% was sold. Findings showed that vegetables produced in school gardens have multiple uses. Distribution of garden produce to students is one way of engaging parents to participate in school gardening activities as well as in home gardening.

In the three (3) sentinel schools where intensive coaching and mentoring and detailed documentation were done, there was a higher utilization of garden produce as compared to the rest of the LS. Julugan Elementary School (JES) was able to use 82% of the harvest in the school-based feeding program (SBFP), with leafy vegetables (71%) contributing the most. Sunny Brooke Elementary School (SBES) used 66% of the garden produce in the SBFP, which are mostly leafy vegetables as well (41%). In Tinabunan Elementary School (TES), 54% was used in the SBFP wherein 26% are leafy vegetables and 22% are fruit-bearing vegetables. There are cases where schools may need to invest initially in garden infrastructures and other garden inputs.
to address challenges i.e. soil, composting bins, rain water harvesting tanks, drainage system to improve overall garden productivity.

When schools grow vegetables in their gardens and when menus feature diverse vegetables, schools can reduce the cost of feeding. Savings accumulate over a typical feeding cycle. Table 1 and 2 show the savings that were generated by schools with the use of garden produce within 120 days (Php 56.92/USD 1.14) and 200 days (PhP 126.48/ USD 2.53) respectively.

Table 1. Savings on expenses in a 120-day feeding cycle in sentinel schools.

<table>
<thead>
<tr>
<th>School</th>
<th>Total no. of beneficiaries</th>
<th>Total cost (PhP) (no. of beneficiaries x 16.00 x 120days)</th>
<th>Peso value of garden produce used to SBFP (PhP)</th>
<th>Savings per student in 120 feeding days (PhP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>JES</td>
<td>278</td>
<td>533,760.00</td>
<td>18,398.63</td>
<td>66.18</td>
</tr>
<tr>
<td>SBES</td>
<td>769</td>
<td>1,476,480.00</td>
<td>20,573.02</td>
<td>26.76</td>
</tr>
<tr>
<td>TES</td>
<td>131</td>
<td>251,520.00</td>
<td>10,194.88</td>
<td>77.82</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td></td>
<td></td>
<td>56.92</td>
</tr>
</tbody>
</table>

Table 2. Savings on expenses in a 200-day feeding cycle in sentinel schools.

<table>
<thead>
<tr>
<th>School</th>
<th>Total no. of beneficiaries</th>
<th>SBFP total food cost for 120-day feeding (PhP) (a x PhP16 x 200days)</th>
<th>Peso value of garden produce used in SBFP (PhP)</th>
<th>Savings per student in 200-days feeding (PhP) (c/a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>JES</td>
<td>278</td>
<td>889,600.00</td>
<td>35,127.63</td>
<td>126.36</td>
</tr>
<tr>
<td>SBES</td>
<td>769</td>
<td>2,460,800.00</td>
<td>36,389.64</td>
<td>47.32</td>
</tr>
<tr>
<td>TES</td>
<td>131</td>
<td>419,200.00</td>
<td>26,953.57</td>
<td>205.75</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td></td>
<td></td>
<td>126.48</td>
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</table>

Table 3 shows the number of children that can benefit from a 200 square meter garden. On the average, 32 students are estimated to be served with a vegetable meal in 120 days considering that about 270 kilograms of various vegetables are produced in the school garden.

Table 3. Total number of children that can benefit from the garden produce shared to SBFP in the three sentinel schools.

<table>
<thead>
<tr>
<th>School</th>
<th>Total vegetables needed in recipe per child in 120-day feeding (kg)</th>
<th>Total Garden Produce within 120-day feeding period (kg)</th>
<th>Total garden produce used in SBFP recipe (kg)</th>
<th>% of garden produce used in SBFP (c/b)</th>
<th>Estimated number of beneficiaries (c/a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>JES</td>
<td>7.72</td>
<td>388.47</td>
<td>294.18</td>
<td>75.7</td>
<td>38</td>
</tr>
<tr>
<td>SBES</td>
<td>8.94</td>
<td>580.59</td>
<td>349.25</td>
<td>60.1</td>
<td>39</td>
</tr>
<tr>
<td>TES</td>
<td>8.82</td>
<td>412.69</td>
<td>168.87</td>
<td>40.9</td>
<td>19</td>
</tr>
<tr>
<td>Average</td>
<td>8.50</td>
<td>270.76</td>
<td>58.8</td>
<td>32</td>
<td></td>
</tr>
</tbody>
</table>
On the use of iron-fortified rice (IFR), in a consultation meeting with retailers and at least 10 school administrators, it was revealed that scaling up of IFR within the school setting requires strong partnership (and engagement) with local businesses and local government units. Each school has their own supplier, thus, IFR should be made available to these suppliers via local rice distributors. Rice variety must also be considered to avoid plate waste among school feeding beneficiaries (as observed in schools).

- **School Garden – Education Link**

Use of gardens for learning is guaranteed if the following conditions are met:
- Gardens are functional all year-round. Year-round availability of vegetables in the garden can be achieved with cultivation of diverse crops combining both annuals and perennials and drought and pest/disease tolerant crops
- Presence of information, education, and communication materials about bio-intensive gardening practices and indigenous vegetables within the garden
- Garden visit as a class activity or methodology are incorporated in the lesson plans of teachers
- Continuous monitoring and technical support from school administrators and division level supervisors

Fifty-two schools (52) were able to utilize school gardens in other learning areas aside from agriculture. In the 36 schools with complete data, the garden was mostly used in the following areas – Science (Grades 4-6), EsP – “Edukasyon sa Pagpapakatao” (Grades 1-6), Mathematics (Grades 1-6), and Meeting time 2 (Kindergarten). Few schools reported to have used the garden in Social Science, English, Filipino, Mother Tongue and other minor subjects. On a wider scale, institutionalization and sustainability can be achieved if use of garden is incorporated in the DepEd curriculum guide.

- **Nutrition Education - School Feeding Link**

One of the strategic venues where nutrition education activities can be undertaken is the feeding center. Food served can be a medium to discuss food value and functions, which reinforces the actual feeding that happens. The following are the facilitating factors identified:
- Inclusion of nutrition education in the School Based Feeding Program (SBFP) guideline
- Provision of nutrition education modules to grade level coordinators and SBFP coordinators
- Capacity building of SBFP coordinators
- Availability of ready-to-use materials such as flash cards, posters, and flipcharts
- Inclusion of nutrition session during parent-teacher meeting and conference
- Technical assistance and follow up

Of the 58 LS, 44 were able to continuously deliver nutrition education during feeding activities via lecture, teacher demonstration, games, audio-visual presentation, cooking demonstration, nutri quiz, peer teaching, puzzle, cooking festival and garden tour. Different nutrition education modalities had improved knowledge of children and parents, which resulted to no plate waste among schoolchildren thereby increasing vegetable consumption. The nutrition education
activities have also built a sense of cooperation among parents to help in the feeding activities and in maintaining the vegetable gardens as observed in schools.

**School - Community Partnership**

Barangay or village officials from the 3 sentinel research schools were engaged during the 80-day additional feeding since it was conducted during school vacation. Barangay health workers and barangay nutrition scholars were responsible in bringing children from the community to school at lunch time and supported teachers in the conduct of the actual feeding. There are also other ways identified where community volunteers can be engaged to support school nutrition activities such as nutrition assessment, home visits of identified undernourished school children and nutrition education activities.

**Results obtained with regards to gardens, supplementary feeding and nutrition components and their integration**

**Improvement in soil quality in school gardens**

Bio-intensive garden techniques help regenerate the soil and replenish its capacity to grow healthy crops. Two years after the introduction of bio-intensive gardening, soils were tested in the 3 sentinel research schools. Two types of soil samples were collected and analyzed: (1) soil collected from sites without intervention and (2) soil collected from sites where BIG practices were used. Table 3 provides evidence of the improvement in soil fertility status (availability of essential soil nutrients) in soils. The implications of these changes were important. For example, a decrease in soil pH from 7.6 to 7.2 can be expected to result in improved availability of most essential elements (N, P, K, CA, and Mg) needed for growing vegetables. However, especially significant were the high amounts of nitrogen, phosphorus, and organic matter in gardens that employed bio-intensive gardening practices. The use of climate- and nutrient smart practices — i.e., application of organic matter and fertilization (compost and liquid fertilizer), cover cropping, crop rotation, green manuring, mulching, crop diversification — would have contributed to overall improvement of soil nutritional status and health.

Table 4. Results of soil analysis in the three sentinel schools

<table>
<thead>
<tr>
<th></th>
<th>Non-Bio intensive garden area</th>
<th>Bio intensive garden area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>JES</td>
<td>TES</td>
</tr>
<tr>
<td>Soil pH</td>
<td>7.6</td>
<td>7.6</td>
</tr>
<tr>
<td>Nitrogen (N)</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Phosphorus (P)</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Potassium (K)</td>
<td>Sufficient</td>
<td>Sufficient</td>
</tr>
<tr>
<td>Organic matter (OM), %</td>
<td>1.56</td>
<td>1.37</td>
</tr>
<tr>
<td>Calcium (Ca) cmol/kg soil</td>
<td>21.19</td>
<td>15.75</td>
</tr>
<tr>
<td>Magnesium (Mg) cmol/kg soil</td>
<td>15.41</td>
<td>4.5</td>
</tr>
</tbody>
</table>
Diversification of Schools Gardens and Conservation of Indigenous Vegetables

Garden diversity was identified as one of the factors that influenced garden functionality and sustainability. Continuous and intensive promotion of indigenous vegetables and substantial distribution efforts contributed to achieving garden diversity. Different types of vegetables such as leafy, fruit-bearing, legumes, root crops, fruit trees, and herbs were grown in schools. After the intervention, an average of 26 crops was recorded in the 58 schools. Crop diversification led to availability of different types of vegetables with varied nutrients and provides teachers the flexibility in the choice of ingredients. A small number of schools reported having difficulty achieving crop diversity (10%) all year round, due to seed saving and seedling propagation challenges.

Improvement in the Nutrition Status of Undernourished Children

DepEd’s regular feeding program runs for 120 days from July to December of every school year. The project supported an additional 80 days to study the effects of 200-day feeding on the nutritional status of school children and identify mechanisms to engage local government units. The developed recipes and Moringa-based recipes were combined to complete the 20 cycle menu. Iron-fortified rice was used in the 3 sentinel schools and was procured directly from Nutridense. The following are the results of the 120-day feeding and the additional 80-day feeding:

Benefits gained from the 120 feeding days:

- There was a significant increase in the mean weight (p-value=0.000) and height (p-value=0.000) of children both male and females
- The increment in the mean height of the male students aged 5 to 10 y.o. from baseline to midline (after 5 months with only 60 feeding days) was 1.99 cm while for females 2.05 cm. These increments are lower than the normal increase of 2.21 cm for males and 2.48 cm for females of the same age group. However, the increment from midline to endpoint (after another 3 months with 60 feeding days) was 1.51 cm (males) 1.70 cm (females) which are higher compared to the normal increase of 1.32 cm and 1.51 cm, respectively. Same result was observed in the female students aged 10.1to 19 years, the increment (1.83) was higher compared to the normal increase of 1.46 cm. However, the increment in the mean height of the male students from midline to end point is similar (1.68 cm) compared to the normal increase of 1.69 cm.
- There was a significant decrease in the proportion of undernourished students aged 5.1-10 and 10.1-19 y.o. from baseline (100%) to endpoint (64.71%).

Results of additional 80 feeding days in sentinel schools:

To determine if there exist further additional benefits for extending the feeding period for another 80 days during the 2 and a half school break, the schools have continued feeding in schools. Each school had different strategies to convene children from the community in the school. There were 195 out of 277 students who participated in the additional 80 feeding days after the regular 120 feeding days in the sentinel schools.
High compliance of daily feeding in school was between 50 to 60 days and only 12% had completed the 80 days.

There was a further significant increase in the mean weight and height of the students at end of the 80 feeding days in both age groups and gender (p>0.005).

The increment in the mean height of the male students aged 5 to 10 y.o from end of the regular 120 feeding days (March) to end of the 80 feeding days in July 2017 was 1.57 cm while for females 1.96 cm. The increments are lower than the normal increase of 1.75 for male and 2.04 for female of the same age group. Same result was observed in the male and female students’ aged 10.1 to 19 y.o. The increment was 1.84 for male and for female was 1.96. The increment was lower than the normal increase of 2.24 for male and 2.04 for female.

There was no significant change seen in the proportion of undernourished students aged 5.1 – 10 and 10.1-19 y.o.

**Objective 2: To test a multi-scalar approach to scale up and sustain the school nutrition model**

A multi-scalar approach was deployed to bring to scale the integrated school nutrition model. The first pathway is a horizontal scaling, which involves a network of LS in a single region designated as learning hubs, action-research sites, and seed propagation centers. The second scaling up pathway is a vertical scaling, which was aimed at the national level, influencing relevant national agencies and policymakers through theme presentations and related dialogue processes. The following are the detailed characterization of the scaling up strategies deployed and outcomes at the sub-national and national levels:

**Scaling Up Mechanisms and Strategies**

- **Creating an enabling environment at the national and sub-national level**

One of the important requirements for adoption and implementation of the model is the issuance of a memorandum order since DepEd still follows a centralized set up. In 2016, memoranda were issued, which included: bio-intensive gardening approach in national guidelines of GPP – “Gulayan sa Paaralan” program or Gardening in Schools program (DepEd Memorandum No. 223, s. 2016); use of iron-fortified rice and recipes with indigenous vegetables for the feeding in the school-based feeding program national guidelines (DepEd Order No. 39, s. 2017); and establishment of crop museums in every school division (DepEd Memorandum No. 223, s. 2016.

At the regional level, 2 memoranda were sent to all 19 divisions of Region 4A in support of the implementation of the nutrition model and establishment of additional crop museums (Regional Memorandum No. 226, s. 2016 and Regional Memorandum No. 446, s. 2017). This served as a legal document allowing school administrators to incorporate activities into their school improvement plan and in turn allow them to allocate resources to strengthen the program. At the division level, memorandums were also issued to reinforce the regional level memorandum. Phase 1 study results as well as the developed information, education and communication materials were instrumental in setting a supportive environment.

- **Multi-level capacity building program for school program implementers**
The capacity building program was designed for school level implementers and school officials and program planners at various levels within DepEd (national, sub-national, division levels). The program includes one round of training of trainers; a consultative workshop with school principals; series of orientation of division-level school officials from the 19 school divisions of Region IVA; 2 learning and sharing events; provision of different types of IEC materials such as modules, posters, primers, technical briefing guides; provision of basic garden tools and planting materials, and on-site coaching and mentoring. A total of 164 from the 58 schools and division offices were trained during the training of trainers. Manuals were developed and given to lighthouse schools. The combination of several methodologies such as classroom discussion, practicum, and field visit were regarded by participants as effective in transferring knowledge and skills. The training program was carefully designed and has enabled school staff to train other schools. For technical assistance of local actors, it’s important to consider the staff movement within the DepEd system in planning and programming to avoid unplanned visit for re-training/re-orientation.

- **Development and management of IEC materials**

The complete package of information, education, and communication (IEC) materials was a catalyst in the diffusion of the model and guidelines. Different forms of IEC materials were developed as support to school implementers and as promotional materials to officials at various levels. The materials were used by schools in various ways. For school-level implementers, the following materials were distributed: 7 posters, integrated school nutrition model 1-page handout, lighthouse school primer, crop museum primer, training manual, nutrition education modules, crop information, crop labels, BIG standards, and nutrition education guide handout. Posters were placed mostly in school feeding rooms, bulletin boards, and garden sheds for children and parents to learn from. The primers are meant as guide for teachers in their extension work. A school nutrition brief, which presents the research project and strategies, was developed and given to school officials at different levels during the project inception phase, which ensured clarity of the research activities to be undertaken. A summary of the phase 1 research results for each component were also packaged into a single handout. These handouts included costing for each component, which was used both by schools and the project team to generate support for school nutrition program needs.

The nutrition education modules were distributed to all LS, which enabled teachers to integrate nutrition messages into their lessons. The demand for information, education and communication materials by schools, local government offices, and the private sector indicates its value and usefulness in disseminating nutrition messages. DepEd’s national office allocated USD150.00 for each of the 220 schools to procure these IEC materials during the training. IIRR partnered with a printing press for its mass production. These IEC materials can be downloaded at [https://schoolnutritionphils.wordpress.com/](https://schoolnutritionphils.wordpress.com/). The project implementation team formed per division was helpful in disseminating information faster to schools in the region.

- **Establishment of network of lighthouse schools**

A lighthouse school (LS) is a designated focal point for establishing evidence (decentralized and
location-specific action research (site) of integrated school nutrition model) and for supporting the advocacy and out scaling school nutrition efforts of the Department of Education in the Philippines. LS played the main role in disseminating the model at the sub-national level. Fifty-eight (58) LS were established within Region 4A, which is also known as CALABARZON. Learning and sharing events were conducted in LS. To date, 19 school divisions conducted strategic activities to disseminate the model within their respective school districts and division using various methods i.e orientation, issuance of memoranda and training. The 58 LS were also designated as crop museums (CM). Crop museum 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. Crop museums also serve as nurseries (source of planting materials) for surrounding schools and communities. Selection of LS used the following criteria: garden areas should be at least 200 sq meters, garden’s performance in the past years, performance of the agriculture teacher, and support of the school administrator to the nutrition program. Face-to-face dialogue with school administrators was important to ensure clarity of roles of the LS and crop museums and to discuss challenges affecting implementation.

- **Establishment of additional crop museums and seed exchange activities**

School crop museum (CM) played a role in the dispersal of planting materials across 19 school divisions in Region IVA. Additional 237 schools were designated as crop museums to serve as community seed banks of nutritionally relevant indigenous crops in the region. Support extended includes planting materials and information, education, and communication materials. Seed exchange is another event that was successfully institutionalized within Region IVA to facilitate retrieval and popularization of indigenous/local vegetables and to promote self-reliance among school divisions. Eighteen (18) divisions were able to conduct seed exchanges involving 1359 schools. Seed exchanges contributed to conservation of agro-biodiversity and promote garden diversification.

- **Multi-stake holder events to build broad-based partnership for school nutrition**

Multi-stakeholder events were used by the project as platform to share good practices and innovation to diverse audience. They were important in publicizing project innovations and research results to a wide-range of potential users other than DepEd, such as the Department of Social Welfare and Development, Department of Agriculture, non-government organizations, and local government units. Two major events were organized to introduce the integrated model and draw support for school nutrition. The first event was a learning and sharing activity held in one of the lighthouse schools and was attended by 98 participants composed of municipal social welfare development officers, government, and non-government representatives. Holding the activity in schools made a difference since most local government units are not aware of school nutrition program. In this activity, ways to support nutrition programs are discussed. It was also a venue where representatives from government agencies shared their own standpoint and experiences on similar interventions. The second event was a school nutrition conference held in May 2018 attended by 109 participants representing 6 agencies/institutions where results were presented. Exhibition of the various innovations were set up during these 2 events which include display of diverse seedlings and vegetables, tasting of recipes, modules and posters, boosted
participants’ interest in the innovations shared.

- **Research dissemination via multiple platforms**

Multiple events were identified to share research findings and different innovations developed. The project team participated in the exhibit during the Food Security Forum at the Asian Development Bank in June 2016 to showcase the integrated school nutrition model and generate support and forged partnership with various group for the scaling out. The model and initial findings were also shared in the following events: Philippine Association of Nutrition (PAN) Convention in July 2017 with more than 1000 attendees; Philippine Society of Nutritionist-Dietitians, Inc. (PSND) Convention in October 2017 with 250 participants; DepEd Region 4A International Conference of Basic Education Researchers (ICBER) 2017 with 2287 participants; Department of Social Welfare and Development MIMAROPA Review and Planning Workshop for Supplementary Feeding in 2017. These events were helpful in enlarging the network of possible partners. In the case of DSWD MIMAROPA, a collaborative project is being discussed.

The research was also presented during DepEd’s national events such as the DepEd Gulayan sa Paaralan Program National Workshop in 2017 and the Consultative Workshop on Nutrition Services in January 2018. Positive response from participants influenced the national program planners to decide to scale it out, which commenced in March 2018.

Events organized by non-government organizations also served as point of dissemination. The model was shared to a multi-stakeholder event organized by Green Peace in October 2017 in observance of the World Food Day participated by 373 participants. Another event is the Campaign on Healthy Diet in April 2018 attended by 150 participants. Another event involved sharing among non-government organizations via Philippine Coalition of Advocates for Nutrition Security (PhilCAN). The sharing resulted to a joint venture between the Adventist Development Relief Agency (ADRA) and IIRR to train 10 schools in Region V. Plan International included the model in one of their First 1000 Days Program.

In South East Asia, sharing and promotion to generate support for school nutrition were also held. Project experience and research results were shared during a round table discussion organized by IIRR in Yangon, Myanmar in September 2016. It was attended by 50 participants from 46 agencies. Out of this was a discussion of possible partnership for school gardening. This was followed by a learning and sharing activity among officials from IIRR, DepEd, and FNRI-DOST, officials from Myanmar’s Ministry of Education and Health and representative from the Parliament (activity reports will be shared upon request). Dr. A. Zin Latt, a member of the parliament (lower house) made a commitment to advocate for school feeding program in Myanmar schools. The model as well as the processes undertaken to institutionalize and scale up strategy were also featured during the Southeast Asian Ministers of Education Organization-Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEAMEO-SEARCA) international conference on multi-functionality of school gardens and training of trainers in April 2018 with 156 participants. Lighthouse schools in Cavite were also visited by the group. A possible partnership between Biodiversity International and IIRR is being discussed to strengthen nutrition education in schools.
A website was set up and maintained where outputs are shared to wider audience (see https://schoolnutritionphils.wordpress.com/)

- **Generating evidence for scaling up and policy formulation**

  The project worked on the assumption that scaling up and institutionalization of innovations relies on evidence of its effectiveness and scalability. Data collected showed that all 58 lighthouse schools practice bio-intensive gardening at different levels. Garden diversity has been achieved by 52 schools and the link between gardens, feeding, and learning was evident. In the 3 sentinel research schools, the 120-day school feeding program of the DepEd resulted to significant increase in the mean weight of students from baseline to endline. The extended feeding program or additional 80 days was implemented by the project in 3 sentinel research schools and was completed in July 2017. Nutrition education activities that were commonly used and sustained were documented.

  Evidence generated in phase 1 and 2 played a major role in influencing national-level program planners to adopt the model and allocated 18 million pesos (USD 360,000.00) in 2018 for nationwide dissemination via training of 220 lighthouse schools (1 per school division in the Philippines). Training commenced in March 2018 and will be completed in September 2018. Follow up activities have been identified such as mentoring of LS and review and planning after six months. DepEd made a commitment to fund a follow up review and planning activities and monitoring. The availability of a range of knowledge products is an evidence of its readiness to be scaled up. The establishment of 58 Lighthouse schools (LS) led to a wide-scale data collection. In order for the 58 LS to take on those roles, a capacity building program was implemented. Baseline and endline data were collected and analyzed to serve as basis for recommendations and policy formulation. Teachers played a significant role in documenting activities and data within their respective schools.

- **Round table dialogue and targeted discussions**

  Round table dialogue (RTD) and targeted discussions were organized with key decision makers and officials and that resulted to positive outputs. The project team met with different key officials of DepEd at the start of the project to secure needed support and to ensure adoption by schools. After data were collected and analyzed, series of meetings with different key officials at the national office were done to advocate and present the study.

  Two key RTDs with the Department of Agriculture (DA) were done. The RTD allowed DA and IIRR to share initiatives and identify similar objective and ways to collaborate. The project team met with key DA officials in October 2016. This was followed by another consultation meeting with the DA-Bureau of Plant Industry (DA-BPI) that led to a forging of partnership. A technical working group was established composed of representatives from DA-BPI, DepEd Bureau of Learner Support Services (BLSS), and IIRR to strengthen the crop museums in Region 4A and to promote a similar concept in another region as part of the scaling out. Another RTD was also organized with 6 private sector representatives. Information, education, and communication materials were shared during this event to encourage use of project outputs in their existing nutrition programs. RTDs effectively engaged and solicited support from local government units.
(LGU) as experienced by the project team during implementation. Discussions were held with local government officials organized by the 3 sentinel schools. This platform brought together DepEd supervisors, school principals, and local government units to discuss ways how LGUs can support schools with its nutrition program. Another pathway to engage local officials is participation in the league of mayor’s meeting, which happens periodically.

- **Engaging the media**

It is recognized that media have a major role in influencing the wider public. Reporters and writers were engaged in an attempt to draw media’s attention to important issues such as nutrition and food security, role of agro biodiversity, climate change, and food safety. A compilation of resource materials especially prepared for media personnel were distributed. Three media professionals were given additional and longer exposure visits and participated in events undertaken as part of this project. Nine articles were written about the project (links were provided above).

- **Use of social media as platform for information sharing**

Social media remains to be a significant and low cost platform to disseminate new knowledge, lessons learned, accomplishments, activities, and innovations among the community of practice to sustain a movement. The project team created a Facebook group (GarNESupp) that now has 1047 members composed mostly of school teachers (https://web.facebook.com/groups/GarNESupp/). The site is being utilized by schools teachers to share activity photos, announcements, and training opportunities.

**Outcomes Achieved at the Sub-national Level**

- **Wide-scale adoption of BIG**

Continuous capacity building through experiential training; provision of information, education, and communication material; and regular visit for technical input and monitoring led to adoption of practices and further scaling out of the BIG approach. The BIG standard was enhanced and disseminated to maximize the multi-functionality of gardens. Data collected in 58 schools showed that there is significant increase in the adoption of 12 BIG practices (see Annex 19, Adoption of BIG practices). Organic mulching and chemical-free gardening shows the highest adoption among the set of garden standards. On the other hand, application of liquid fertilizer has the slightest increase (67%) followed by application of organic mulch and rainwater catchment installation (78%). Data collected revealed that non-adoption reasons include: the stench produced during fermentation makes the practice unappealing to teachers; application of compost is perceived to be easier; and unavailability of barrels and other materials. In a number of schools, management of garden and adoption of BIG were affected by teaching loads of coordinators and overlapping school activities.

- **Adoption of recipes with indigenous vegetables**

DepEd schools are required to use a minimum of 20 cycles (1-2 months) of menu, with the
recommended dishes. A variety of menus exist, including the *Moringa*-based recipe and others that were recommended by each schools division office. The 15 recipes developed were already introduced during Phase I. The 15 recipes with indigenous vegetables were recommended because the recipes were already standardized and included indigenous vegetables as primary ingredient options. Recipe adaption can help in utilizing garden vegetables in compliance with set guidelines. Schools were encouraged to adjust or explore other recipe combinations to enable them to utilize the garden produce and to meet the needs of beneficiaries. From 7.19 recipes, the number of recipes adopted had increased to 9.70. Aside from the support given to schools, the issuance of memorandum that includes the endorsement of the 15 recipes led to increase in adoption.

Table 5. Average number of recipes Used and adapted from the 20 recommended FNRI recipes

<table>
<thead>
<tr>
<th>Recipe source</th>
<th>Baseline</th>
<th>Endline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>June 2016</td>
<td>November 2017</td>
</tr>
<tr>
<td></td>
<td>S/Y 2016 – 2017</td>
<td>S/Y 2017-2018</td>
</tr>
<tr>
<td></td>
<td>Number of recipes adopted</td>
<td>Number of recipes adopted</td>
</tr>
<tr>
<td>Recipes with indigenous vegetables</td>
<td>7.19</td>
<td>9.70</td>
</tr>
<tr>
<td>Malunggay-based</td>
<td>12.83</td>
<td>10.30</td>
</tr>
</tbody>
</table>

At the initial phase of the project, a number of school division offices strictly used the *Moringa*-based recipes, thus limiting the use of other vegetables from the garden. Schools with a flexible menu cycle and has more number of days within a cycle have allowed further utilization of garden produce.

- **Adoption of nutrition education strategies**

Nutrition education (NE) strategies included in the guideline were divided into two main modalities – non formal and formal. Non-formal NE methods target parents, teachers, and the general community while formal NE modes are directed towards students. The most widely used mode of NE is the participatory NE activities for community and parents (83.64%), followed by NE during feeding (74.55%), nutrition integration in lessons and NE during PTA/PTCs both at 67.27%, and garden-based nutrition-education (65.45%). The following must be considered for effective and sustained nutrition education: availability of sufficient human and material resources, sustained support and interest of parents/guardians, and nutrition knowledge and skills of program coordinators.

- **Teacher-to-teacher extension fostered**

Trained teachers were given the responsibility to train other teachers within their respective school districts or school divisions. A total of 1,598 schools and 626 parents were reached. Inter-division learning exchanges and benchmarking activities were conducted across the region. In addition, LS schools shared seeds to other schools within their own division.

- **Additional investment in building capacities of schools**

Baseline information was presented to DepEd Region IVA program planners. One of the issues
pointed out is the capacity of school staff in conducting nutrition assessment. As a response, the Education Support Services Division (ESSD) of DepEd Region IVA, which oversees the school-based feeding program, organized a three-day training in November 2016 to capacitate school health personnel composed of medical doctors and nurses. ESSD also allocated funds for 17 sets of weighing scale and height board for the schools and city divisions.

Outcomes Achieved at the National Level

- **Collaboration and resource-sharing**

Constructive dialogue with various government officials of the Department of Agriculture (DA) and the Department of Social Welfare and Development (DSWD) led to multiple trainings to disseminate the model. The Department of Agriculture- Bureau of Plant Industry (DA-BPI) funded the 3-day training of 37 participants composed of 23 DA regional level staff from 17 regions in the Philippines and 14 DepEd regional level representatives. This was followed by a training program funded by DSWD Region IVA (DSWD IVA) for 88 participants in 2017 and a planned training for 177 child development workers in 4 provinces. DSWD Region IVB, also known as MIMAROPA, included gardening program in its Regional Plan of Action for Nutrition as a result of the research sharing and partnership discussions a attended.

Three other organizations (Fostering Education & Environment for Development or FEED, Inc., Angat Buhay Program of the Office of the Vice President, and Adventist Development and Relief Agency) engaged members of the project team to train schools and child development workers in other provinces in the Philippines.

- **Increased investment on school nutrition**

At the national level, the model and the scaling out plan was presented at strategic events. As a result, during the formulation of the Philippine Plan of Action for Nutrition (PPAN) 2017-2022, the Department of Education made a commitment to promote the integrated school nutrition model to all schools in the Philippines. So in 2017, DepEd allocated additional funds for its school nutrition program (18 million pesos /USD 360,000.00) for teachers’ training and reprinting of all IEC materials. A total of 220 schools, one from each school division across the Philippines, are currently being designated and trained to be lighthouse schools. Three regions (Region I, II, and CAR) have already been trained.

- **Institutionalization of the model**

A discussion with a DepEd undersecretary led to an agreement to have a DepEd Memorandum Order for schools to adapt and implement the integrated school nutrition model. Crafting of the memorandum order is on-going and once signed by the secretary, all of the 46,000 public elementary schools in the Philippines will be mandated to adopt the integrated approach. This research project made the case for this to happen and will continue to provide the methodological and technical innovations to support DepEd via the knowledge productions, working papers, primers, and IEC materials featuring research-derived recommendations.
Objective 3: To use schools as platforms for nutritional and environmental learning and sharing

The strategy that was developed takes advantage of the potential of schools to directly influence learners and indirectly influence parents. The following are the enabling factors for schools to serve as local level platforms for nutritional and environmental sharing: capacity development and sensitization of school administrators; development and dissemination of nutrition-agriculture learning modules for teachers; institutionalization of garden-based teaching; promotion of an approach that allows children to bring acquired skills and knowledge at home i.e. distribution of garden produce and seeds; and designation of nutrition and environmental education coordinator (if possible).

Nutrition and environmental knowledge of children can be reinforced during classroom activities, school feeding activities, and garden visits. These activities are feasible based on data collected from LS. Thirty seven LS were able to integrate nutrition-related themes in other subject areas: Mathematics (70.27%); more than half of the 37 LS integrated nutrition in Araling Panlipunan (Social Studies), Edukasyon sa Pagpapakatao (Values Formation), English, and Filipino. All these subjects are taught to students in Grades 1 to 6. Nutrition education during feeding time was carried out by 41 LS. Thirty-six LS reported that they conducted garden-based learning activities during the project period.

Meanwhile, to reach parents/community members, schools organized participatory nutrition education activities that made use of experiential learning methodology. Activities done by schools were recipe development and garden tours. Forty-six lighthouse schools were able to conduct these activities during the past 24 months and most schools reported to have done it in July during the nutrition awareness month, which is mandated through a presidential decree.

Nutrition education was also delivered during the parent-teacher association meeting and parent-teacher conference as implemented by 37 LS. The concept of school crop museum was also instrumental in encouraging schools to produce seeds for communities. Distribution of seeds to 327 community members was also noted by 13 LS.

Research partnerships - as a result of IDRC funding:

The project brought together 3 agencies to scale up the developed model. The collaboration of the International Institute of Rural Reconstruction (IIRR), Food and Nutrition Research Institute of the Department of Science and Technology (FNRI-DOST), and the Department of Education (DepEd) is an example of how partnership can lead to complementation of current institutional capacities. FNRI-DOST, the lead agency in food and nutrition research and development in the country, provided guidance on research procedures and methodologies. Meanwhile, IIRR, having a track record in innovating agro-ecological agriculture approaches, capacity development, and stakeholder engagement, led the overall operationalization of identified strategies. DepEd, having recognized the benefits the research can do to improve the nutritional well-being of school children, ensured that enabling mechanisms are in place. School teachers from the 58 lighthouse schools played a significant role in the data collection process.

The writeshop process, which IIRR pioneered, was used to document good practices through
case studies. Participants included school principals and supervisors. Participants expressed appreciation for being part of the process as they considered it as training and learning opportunity.

Research on scaling up was a new endeavor for all partners. Thus, the whole process of scaling up the model and the documentation of mechanisms contributed to the capacity development of the whole project team.

The Department of Education, during its annual partnership forum, awarded certificates of appreciation to both IIRR and FNRI-DOST.

The research partnerships that emerged from this project featured an international non-government organization, a food and nutrition research center, and a government department at different levels. The tripartite research partnership brought multiple perspectives to the research endeavor, thus enhancing the relevance of the research effort and its findings.

**Governance:**
The project was designed to allow participation of all concerned partners and stakeholders in the decision-making process. From project launching to sharing of results, all partner schools were brought on board to ensure ownership of accomplishments. A project management team (PMT) was formed composed of key people from IIRR, DepEd, FNRI-DOST, and DA Region IVA to guarantee involvement of all partners in the project implementation (*Annex 20: Project management team members*). PMT meeting was conducted periodically to provide updates, discuss issues and challenges, and decide on important matters. Minutes of meetings and agreements were documented and shared to the PMT. A review and planning workshop was conducted at the end of every year to reflect and learn from challenges and recalibrated plans.

In the schools, learning materials were developed for various audiences such as teachers, parents, and school children to ensure information is accessible to all stakeholders. The 80-days supplementary feeding that was supported by the project ensured that all undernourished students were identified regardless of age and gender.

**Research ethics**
During the data collection (nutrition status of children) conducted by FNRI-DOST in 6 schools, consent forms were signed by parents.

**Use of research results**
Research results are already being used by DepEd in their programming. Two additional agencies (Department of Agriculture and Department of Social Welfare and Development) were also influenced after confirming the results achieved at the sub-national level. Knowledge products developed were shared to several government and non-government organizations. Summary of key findings were given back to all 58 schools and school division officials to be considered during their implementation of programs.
It’s envisioned that public elementary schools as well as the communities will have access to resources, information, and nutritionally-dense local food crops through the scaling up of the integrated nutrition model.

**Synthesis of results towards AFS themes**

- **Increasing agricultural productivity (Availability)**

Schools continue to employ the BIG approach that was introduced to sustain and improve garden productivity and functionality. The combination of principles and practices outlined in the BIG standards enabled schools to sustain garden health and resilience to climate change impact. Out of 37 lighthouse schools (with complete data on crops planted every month), the average number of different crops grown in a single school year (SY 2016-2017) was 26. This included leafy, rootcrops, legumes, fruit-bearing vegetables, and fruit trees.

A study undertaken in 3 schools show that a 200 square meter garden can produce yields (in kilograms) ranging from 527.72 to 818.11 kilograms. This generated a total amount of revenue ranging from Php30.5034.10 to Php49, 259.01 as shown in table 6.

<table>
<thead>
<tr>
<th>School</th>
<th>Area, m²</th>
<th>Total Yield, kg (All crops planted)</th>
<th>Peso Value of the Total Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sentinel School 1</td>
<td>200.00</td>
<td>527.72</td>
<td>Php30,534.10</td>
</tr>
<tr>
<td>Sentinel School 2</td>
<td>200.00</td>
<td>818.11</td>
<td>Php44,370.42</td>
</tr>
<tr>
<td>Sentinel School 3</td>
<td>200.00</td>
<td>795.67</td>
<td>Php49,259.01</td>
</tr>
</tbody>
</table>

Seed exchanges that are happening in different provinces promote self-reliance of the DepEd Gulayan sa Paaralan Program (Gardening program). It also help conserve agro biodiversity of nutritional importance.

- **Improving access to resources, and/or markets and income (Accessibility)**

The project contributed to access to resources and income in many ways. Data in the 3 sentinel schools showed that because of improved garden outputs, schools are earning from their sales of garden produce. Forty-two percent of the garden produce were used in school-based feeding program (SBFP), 17.39% is shared to canteen, 16.95% of the vegetables were sold, and 23.70% of the vegetables are shared for free to volunteer parents, students, and teachers who helped in gardening activities.

Gardens are now providing supplementary vegetables to school feeding. School garden records collected revealed that vegetables and fruits from the garden that are not utilized in the school feeding are either distributed to children or sold to the community. As mentioned earlier, in the three sentinel research sites and 4 LS where garden output are regularly collected, a total of 1,463 kilograms have been produced - fruit bearing vegetables, leafy vegetables, root crops and select fruits. Twenty five percent was used to support the supplementary feeding, 27% was sold, 5 % was distributed to children, and 44% was used in the canteen for other purposes.
Teachers involved in the project were trained on seed production techniques and storage practices in order for schools to have continuous access to seeds. To start their own seed production, each school was given a seed diversity kit containing different seeds of indigenous vegetables. Seeds of fertilizer trees were also given to schools for propagation. After 10 months, the trees can serve as continuous source of fertilizer. Leaves of *Gliricidia sepium* are already being used as green manure in schools.

The project has developed information, education, and communication materials that can be used by schools to implement the program even without formal training. These particular materials can be used by school administrators to engage potential external partners that can support the program. Various sharing platforms conducted are ways to share knowledge and strategies i.e. BIG approach, recipes, nutrition education materials were made available to other institutions and agencies with similar programs.

- **Improving nutrition (Utilization)**

The project has introduced nutritionally dense indigenous vegetables in school gardens. School gardens are now sources of fresh and safe vegetables for the feeding. The 15 standardized recipes developed in phase 1 are now included in DepEd’s school-based supplementary feeding guideline, making them available to all schools in the country. The recipe, if used, can help children meet the 1/3 recommended energy and nutrient intake (RENI) of a school child for iron or vitamin A. An additional 15 iron-rich recipes were developed and will be promoted first in Region IV A and subsequently in all schools.

The project continues to advocate the use of garden produce in school feeding. Menu planning and recipe development are part of the capacity building program of school staff designed to provide teachers with the knowledge and skills to implement the feeding program. A cropping calendar was developed for school agriculture teachers and feeding coordinators to identify which vegetables are commonly used in the feeding program. This simple tool will hopefully guide the garden coordinator in planning. The recipes developed by FNRI-DOST are already institutionalized at the regional level.

Advocacy at the regional level was also done to improve data collection aside from the capacity building of program implementers. Among the gaps are the absence of appropriate weighing and height taking scales in schools and the shortage of trained teachers. The findings of FNRI-DOST were presented to program planners leading regional- and division-level officials to act on the issue. Procurement of appropriate equipment was done by the schools themselves using their own funds. A regional-level training of trainers was also conducted following the results presented by FNRI-DOST.

The 200-days feeding and use of diverse vegetables and contributed to improvement in nutritional status of school children:

*Benefits gained from the 120 feeding days:*


There was a significant increase in the mean weight (p-value=0.000) and height (p-value=0.000) of children both male and female. The increment in the mean height of the male students aged 5 to 10 y.o. from baseline to midline (after 60 feeding days) was 1.99 cm while for females it is 2.05 cm. These increments are lower than the normal increase of 2.21 cm for males and 2.48 cm for females of the same age group. However, the increment from midline to endpoint (after another 60 feeding days) was 1.51 cm (males) 1.70 cm (females) which is higher compared to the normal increase of 1.32 cm and 1.51 cm, respectively. Same result was observed in the female students’ aged 10.1-19 years. However, increment in the mean height of the male students from midline to end point is similar (1.68 cm) compared to the normal increase of 1.69 cm.

There was a significant decrease in the proportion of undernourished students aged 5.1-10 and 10 to 19 y.o. from baseline (100%) to endpoint (64.71%).

Results of additional 80 feeding days in sentinel schools:

To determine if there exist further additional benefits for extending the feeding period for another 80 days during the 2 and half school break, the schools have continued feeding in school. Each school had different strategies to convene children from the community to the school. There were 195 out of 277 students participated in the additional 80 feeding days after the regular 120 feeding days in the sentinel schools.

There was a further significant increase in the mean weight and height of the students at end of the 80 feeding days in both age groups and gender. Same result was also observed in the mean height of students in older age groups and gender (p>0.005). High compliance of daily feeding in school was between 50 to 60 days and only 12% had completed the 80 days.

Informing policy

The project team participated in several national level planning workshops of various agencies where the integrated model was presented. Round table dialogue was also undertaken with key officials of DepEd and DA as part of advocacy. Four working papers were developed and shared with DepEd to serve as reference in the enhancement of existing guidelines. As early as 2016, existing memoranda and guidelines already incorporated components of the model. In 2018, dialogue with key officials led to an agreement to adopt and institutionalize the model via a Department Order. Nationwide dissemination is already on-going and is fully funded by DepEd.

The working papers will also be shared to agencies with similar programs such as the Department of Agriculture and Department of Social Welfare and Development (DSWD). Two regional offices of DSWD already incorporated components of the model in their regional plan of action for nutrition. DSWD Region IVA funded 2 batches of training for child development workers and training of 177 more is set to happen in July 2018. Key Messages for policy and programming consideration and research briefs were put together and shared during the policy forum attended by 32 participants (congress – 2, senate – 1, national nutrition council governing board members- 8, others - 21).
The strong evidence in phase 1 backed by evidences in phase 2, strong partnership of IIRR, FNRI-DOST and DepEd, sub-national adoption, series of dialogue at various level made contributed to recognition and uptake of the model by DepEd.

**Project outputs**

The project produced several outputs ranging from modules to research reports. These outputs are currently shared through the project website [https://schoolnutritionphils.wordpress.com/](https://schoolnutritionphils.wordpress.com/).

The following are the outputs developed:

- Primers – Levering the Nutrition Contribution of Agriculture; Bio-intensive gardening approach; Crop Museum Primer
- School Nutrition Brief
- Working Papers for DepEd and other agencies
  - Climate and Nutrition Smart Gardens
  - School-based Supplementary Feeding: Its Implementation and Benefits
  - Leveraging Schools as Platforms for Effective Nutrition Interventions: School-Based Feeding Program
  - Enhancing Opportunities for Nutrition Education in Public Elementary Schools in the Philippines
  - Pathways for Scaling Up the Integrated School Nutrition Model
- Key Messages for policy and programming consideration for legislators and program planners
- Training modules
- Nutrition education modules
- Project video

**Problems and challenges**

The following were the challenges encountered by the team:

- With the new set of government officials in July 2016, the team had to meet a number of officials to reorient them about the ongoing project. A number of schools reported transition of school administrators without proper turnover including the ongoing research project. Thus, reorientation to these schools was done.
- In year 1, one challenge was the unforeseen number of days for the baseline data gathering in the 3 sentinel schools and 3 additional schools. This wasn’t anticipated during the budget preparation since selection of schools was done after budget was approved. Adjustments were made to ensure that this important activity is carried out.
- Other major challenges encountered were the coordination and preparation of multi-stakeholder events. The team had challenges in the identification of dates where key people are available.
- Incomplete record in a number of LS due to multiple activities handled by garden and feeding coordinators. As a response, researchers used other means such as email or phone interview. Another reality that the team had to contend with is the movement of DepEd personnel. There were instances wherein the team was not informed that the trained teacher, coordinator, or school principal was moved to another school without doing any endorsement. Hence, re-orientation was conducted.
- There was a delay in the release of school feeding funds in 2016. This means the 200 days feeding in the three sentinel school will include school vacation. It was agreed during the
project management meeting that schools will collaborate with barangay officials to have a mobile feeding center in the communities in April-May 2017.

**Overall assessment and recommendations**

Implementation of the project went smoothly given the clear guidelines and agreed upon milestones of the research project. Funds are released on time thus no delays were experienced in the project. It was also appreciated that IDRC provided opportunity to the primary investigators to attend a scaling up workshop and share research plans and refine research design and scaling up framework based on the learning from the workshop. It also allowed the research team to interact and learn from other IDRC grantees (CIFSRF). It will be good if this type of learning events can be organized by IDRC. Thematic discussions around the areas of integrating gender in research, research design and methodologies can be good inputs to researches at the beginning of the projects. The monitoring visit at least once a year of the IDRC program manager has been very helpful in allowing face-to-face discussion on the progress of the research project, any issue or concern, and needed technical advice. Overall, there is much appreciation on the established systems and mechanisms within IDRC to support the implementation of the research project.

Annex 1. Result of 120 and 80 days feeding
Annex 2. Status of BIG adoption in Cavite
Annex 3. Achievements of Lighthouse Schools
Annex 4. Working paper on School-based Supplementary Feeding: Are We Gaining
Annex 5. Working paper on Climate and Nutrition Smart Gardens
Annex 7. Research Articles Submitted
Annex 8. A compilation of resource materials prepared for media personnel
Annex 9. Primers
Annex 10. Revised nutrition education modules
Annex 11. Posters on school-based feeding and indigenous vegetables
Annex 12. Case stories
Annex 13. Consolidated Nutrition Education Activities
Annex 14. Leveraging Schools as Platforms for Effective Nutrition Interventions: School-Based Feeding Programs
Annex 15. Policy recommendations
Annex 16. School nutrition conference activity report
Annex 17: Policy Forum on School Nutrition
Annex 18. Bio intensive Gardening Standards for Schools
Annex 19. Adoption of BIG practices
Annex 20: Project management team members
Annex 21. Photos compiled
Annex 22. Pathways for Scaling Up the Integrated School Nutrition Model