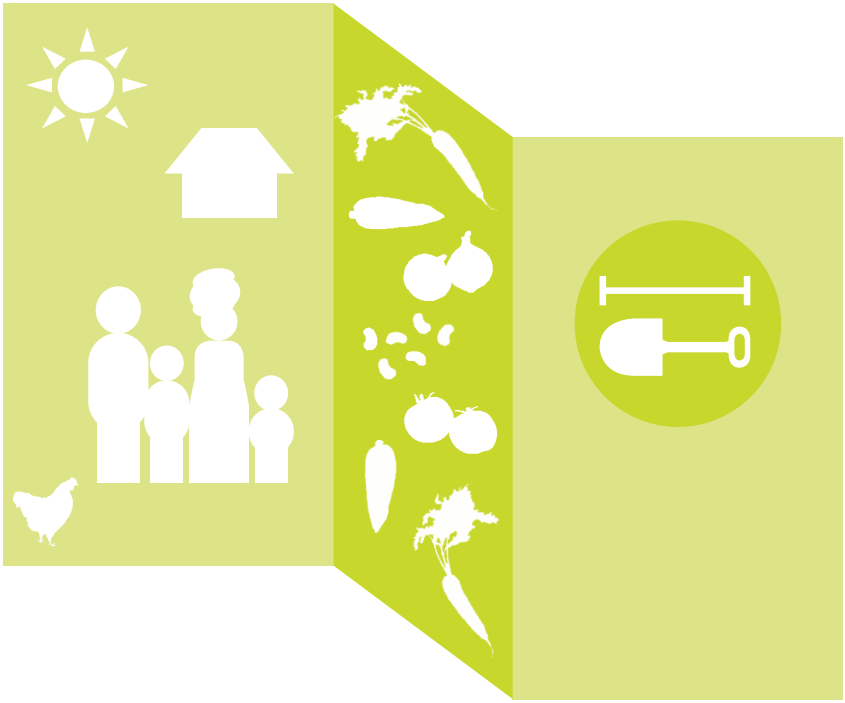
Garden Project Design Guide

Purpose: To guide garden design during the proposal development process

Audience: Technical design lead and relevant sector leads—agriculture, nutrition, gender, water resources and behavior change



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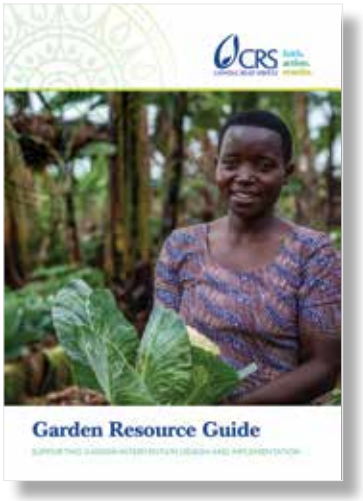

This document is based on the *Garden Resource Guide* where all references are cited. Use it alongside the *Garden Project Design Worksheet*.

CATHOLIC RELIEF SERVICES

Catholic Relief Services is the official international humanitarian agency of the United States catholic community. CRS' relief and development work is accomplished through programs of emergency response, HIV, health, agriculture, education, microfinance and peacebuilding. CRS eases suffering and provides assistance to people in need in more than 100 countries, without regard to race, religion or nationality.

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Acronyms

CDNIP	Community-Driven Nutrition Improvement
DFAP	Development Food Assistance Program
DiNER	Diversification for Nutrition and Enhanced Resilience
FASO	Families Achieving Sustainable Outcomes
gm/cc	Green Manure/Cover Crop
OFSP	orange-fleshed sweet potato
PRIZE	Promoting Recovery in Zimbabwe
PROGRESA	Program of Business Management, Health and Rural Environment
PWD	people with disabilities
RAPID	Resilient Arid Lands Partnerships for Integrated Development
REAAP	Resilience through Enhanced Adaptation, Action-Learning, and Partnership Activity
SDC	Swiss Development Corporation
SEGAMIL	Seguridad Alimentaria Enfocada en los Primeros 1,000 Días
SMART	Strengthening Marriages and Relationships through Planning and Communication
SVF	Seed and Voucher Fairs
TOPS	Technical and Operational Performance Support
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
WALA	Wellness and Agriculture for Life Advancement

Contents

INTRODUCTION

Gardens are widely used in Catholic Relief Services programming to help families grow supplemental food, improve their nutrition, and support families and agri-preneurs to raise incomes. Gardens and horticultural plots can also be used to support women's empowerment; help schools supplement their food supplies; teach students about agriculture, biology and geometry; and provide new enterprise opportunities for women and adolescent girls.

Gardens can be designed for many different contexts, ranging in size and complexity from small, rainfed plots behind the homestead, to irrigated community fields and commercial horticultural plots. In Ethiopia, projects have used gardens to strengthen household resilience and nutrition (REAAP, 2014–2017; DFAP, 2011–2016). In Timor Leste, mothers were taught about gardens to increase dietary diversity (CDNIP, 2014–2018). In Burkina Faso, large irrigated communal plots were successfully developed for women's groups (USAID FASO, 2010–2018) to support food diversification and revenue generation. In Kenya (RAPID, 2015–2020), farmers invested in shade netting to increase productivity for home consumption and market sales. In Nicaragua (USDA PROGRESA, 2015-2019), farmers established highly commercial production plots linked to supermarkets.

This document, therefore, provides guidance on key decisions to be made during the project design. A worksheet accompanies this guide to capture decisions made. In addition to this *Garden Project Design Guide* and *Garden Project Design Worksheet*, there is the *Garden Resource Guide* that provides substantive details related to the technical areas of gardens. There is also an accompanying guide and worksheet for program managers, along with lesson plans and job aids for field agents that can be adapted. These resources can be referenced in proposals as appropriate.

STEP 1: DECIDE GARDEN OUTCOMES

Gardens can be used to achieve three outcomes: 1) improved nutrition and 2) increased income and 3) empowered women. The design team will need to determine the intended outcome(s) of the garden intervention as it responds to the problem analysis and the associated solution tree. To help make this decision, the team needs to gather information either through the problem analysis process or by collecting additional information. Use Table 1 in the *Project Design Worksheet* to capture this information.

Improved nutrition: Information on **nutrient deficiencies**[1] and disaggregated **dietary diversity data**[2] will help the design team understand the local situation and determine if gardens can help improve the nutrition situation, given nutrient constraints. For example, if data shows that communities are deficient in vitamin A and iron, and that there is also low consumption of vitamin A and iron-rich foods, then gardens are likely an appropriate intervention to contribute to nutritional outcomes. However, if data shows there is an iron deficiency but high consumption of iron-rich foods, then gardens may not address the iron deficiency issue as it may be resulting from other causes. More investigation would be needed.

Increased Income

- **Market opportunities**: Rapid community and market studies will help the team assess if there is interest in growing garden produce for sale, and if there is local market demand for fruits and vegetables. It is unlikely that secondary information will be available for local markets, so rapid surveys to determine demand, prices, volumes, seasonality, and prospects for sales to local markets will likely need to be conducted. The Market Opportunity Identification tool in the CRS Value Chain Toolkit is one tool that could be used.
- **Developing local businesses**: Garden produce is high value and relatively large quantities of vegetables can be produced from small production areas. Use of irrigation during the dry season can prolong the growing season to year-round and also provide extended periods of employment and income. Developing market gardens with communities and/or individual agri-preneurs offer new ways of investing into rural communities with long-term benefits. The Market Opportunity Identification tool in the CRS Value Chain Toolkit could be used to identify nutritious crops for developing a local business.

Women's empowerment: Gender literature reviews and existing gender analyses will provide information needed to assess whether gardens can empower women. See Chapter 5 on Gender Integration in the *Garden Resource Guide* for ideas about assessment questions and approaches to empower women with gardens.

Action

What is the expected outcome(s) of the garden for this project and why is this outcome(s) selected? Please note there can be multiple outcomes.

- Improved nutrition
- Increased income
- Women's empowerment

1. Information on nutrient deficiencies can be obtained from Demographic and Health Surveys, national nutrition surveys, UNICEF MICS surveys, and the Global Nutrition Report.
2. The dietary diversity levels that projects should gather information on are average Household Dietary Diversity Score (HDDS), Minimum Dietary Diversity—Women (MDD—W), and the minimum acceptable diet (MAD) for children 6–23 months. This information can be gathered from secondary literature such as the USAID Office of Food for Peace's desk reviews and existing project surveys, or sample data could be collected during proposal assessment. See Annex 1 for a description of these indicators.

STEP 2: DETERMINE THE TARGET AUDIENCE OF THE GARDEN INTERVENTION

The target audience will vary based on the outcomes of the garden. There are three targeting components: households that will garden, members within the household who have specific garden roles, and the end user of garden products. The profile of a target family who will use the end product (fruit, vegetables, pulses, etc.) needs to be defined. The project also needs to decide if the end users of the garden product will be the same as those who produce the garden products or a different group altogether. For those households that produce the garden, decide who within the household will be targeted for intervention-related support (training, inputs, etc.). If targeting women, who are often responsible for gardens, read Chapter 5 of the *Garden Resource Guide* for ideas to support gender-responsive or even gender transformative approaches. Knowing the target audience will guide who to interview when gathering information for using the decision tree assessment tool presented in Step 3.

Examples of targeted audience along with outcomes

- **Nutrition outcome**: Families with children under 5 years that can produce nutrient-dense foods for their own households
- **Income outcomes**
  - **Market opportunity**: Households (with existing gardens) who need production and business skills to engage in the market to sell surplus
  - **Developing local businesses**: Investment-ready entrepreneurial farming households with more than 0.5 acre of land selling most produce

Actions

- Use Table 2 and 3 in the *Garden Project Design Worksheet* to list the criteria for identifying target households as gardeners and end users of products.
- Use Table 4 in the *Garden Project Design Worksheet*, to identify who within the household will receive technical guidance and resources.

STEP 3: ASSESS THE CONTEXT

Often gardens have not been successful or sustainable because the key barriers to their establishment were not assessed during the project design phase. An initial assessment will help the teams make a **"go/no go" decision** on whether to use gardens as an intervention in a project.

The decision tree (Figure 1) helps the team determine if there are major barriers to overcome in investing in gardens. If so, it prompts the design team to consider the technical and financial support needed. The key issues include: local knowledge of gardens, access to quality land, availability of water resources, access to resources (such as tools and seed), available labor, and gender-based constraints.

Often these decisions rely on information that may not be known by the project team; to support the decision-making process in Figure 1, a series of questions is provided in Table 1 that helps the team compile information to apply to the decision tree. Many of these questions can be included in other assessments conducted during the proposal development process.

Please note that the *Program Managers Guide* includes a larger assessment to validate the garden intervention design post-award with the actual target audience.

See Figure 1, Decision tree to assess whether a garden intervention is the right fit for the target community, on Page 5.[3]

See Table 1, Questions for gathering information to guide decision tool response, on Page 6.

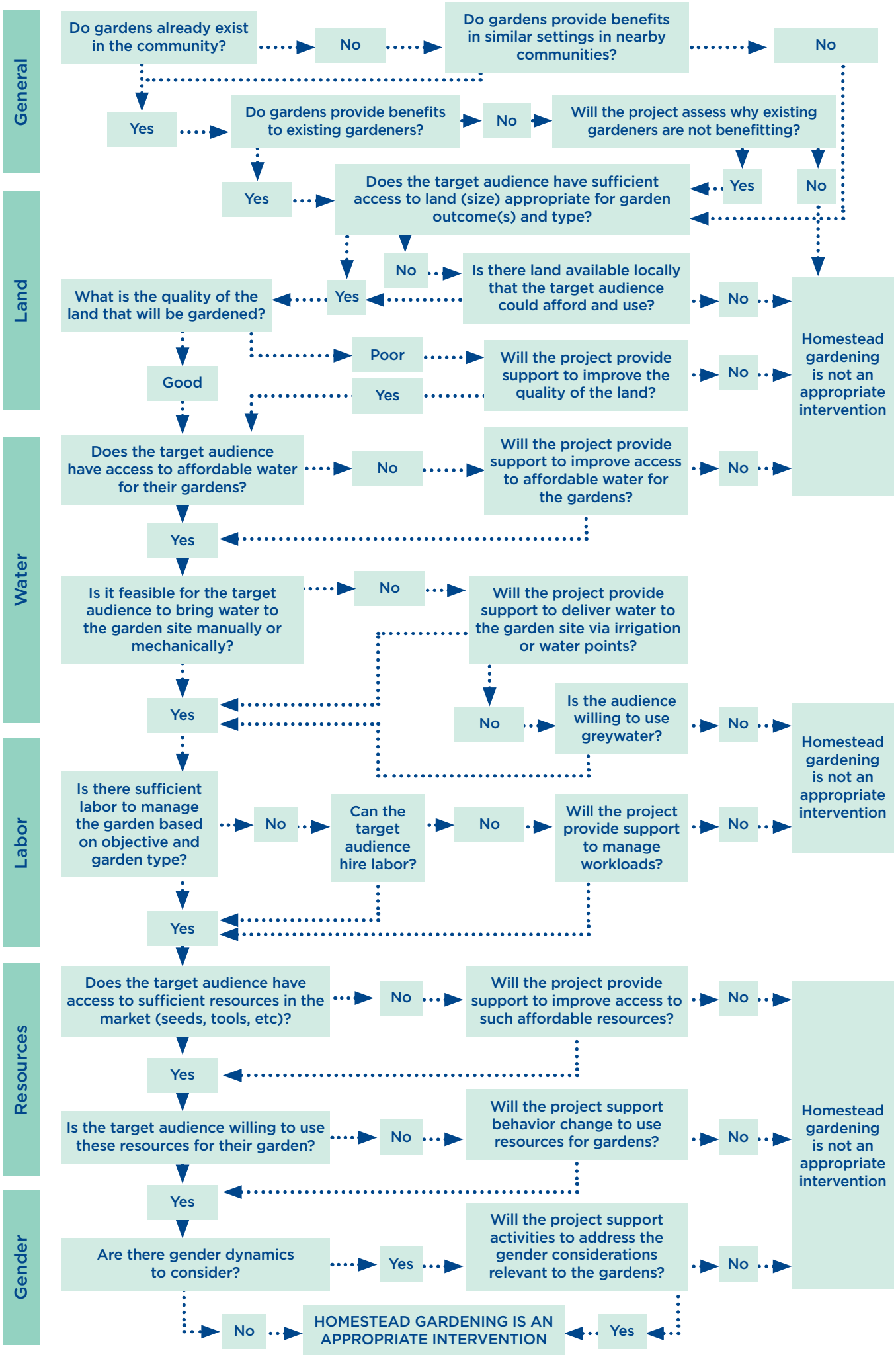
- If a "go" decision is made to include gardens in the project, continue to Step 4 below.
- If a "no go" decision is made, do not proceed with this guidance.

Actions

- Collect sufficient information in order to respond to the decision tree questions.
- Use Table 5 in the *Garden Project Design Worksheet* to determine a go/no go decision on scaling gardens in the project.

3. Adapted from Mitchell R and T Hanstad. 2004. *Small homegarden plots and sustainable livelihoods for the poor*. Livelihood Support Programme (LSP) Working Paper #11. FAO. http://www.fao.org/3/j2545e/j2545e00.htm#Contents.

Figure 1: Decision tree



Adapted from Mitchell and Hanstad 2004.

Table 1: Preliminary assessment questions and methods

Adapted from Mitchell and Hanstad 2004.

Theme	Question	Method
Garden acceptability	Are gardens present in the community?	Observation
	If yes, what benefits do gardeners presently receive from the garden? If no, do gardens provide benefits to families in communities with similar resources and climate?	Key informant interviews (KII) with gardeners in the community Secondary literature
Land	How much of the land is allocated to gardens? Why is this amount allocated?	KIIs with gardeners in the community
	What is the quality of the land available for gardens?	Guided focus group discussion with target families[1]/gardeners KIIs with community leaders
	Who makes decisions within the household on the use of land for gardens?[2] G	Guided focus group discussions with target families / secondary literature
	Is there land available from common property resources that could be loaned for gardens? If yes, do women have access to this loaned land? G	KIIs with community leaders
Water resources	How far are the water sources from potential garden locations?	Resource map
	How does the target population access this water? G	Questions included with resource map activity
	What is the cost for the water?	
	Is the target audience willing to bring water to gardens? If not, why?	
	Who is responsible for bringing water for the garden? G	
	Is the target audience willing to use greywater for irrigation? If not, why?	
	Is it technically feasible to supply adequate amounts of water for scaling gardens? What is the cost per family?	KII with water resource ministry/ commission
Labor and income control	What is the availability of labor for gardening among the target families? G	Guided focus group discussions with target families using daily calendar
	What gender considerations are prevalent among target families regarding gardening labor?	Guided focus group discussions with target families
	Who controls the income earned from the garden? G	
Resources	What materials and inputs are locally accessible to target families? What is the estimated cost of acquiring these? Are they affordable for the target audience?	KIIs with vendors/guided focus group discussions with target families
	Are families willing to invest their own resources, time and labor?	Guided focus group discussions with target families

1. Focus group discussions should be held separately for men and women.

2. G = This question is gender-related

STEP 4: DETERMINE GARDEN TYPE

There are many different types of gardens and selecting the most appropriate type to promote will help ensure the appropriate use of resources. Project design teams should specify the type of garden(s) the project will promote, and technical advisory services and financial resources should be budgeted to support this intervention. A brief description of seven types of gardens is below, along with summarized information in Figure 2 and Table 2. Use the decision tree assessment, literature review results, and staff/partner knowledge to select the garden type(s) the project will promote.

Raised beds

Raised beds.
Photo by CRS staff

The raised bed is the most common type of small garden. A raised or mounded bed is a flat-topped garden bed created by simply mounding soil, compost and rotted manure into a rectangular shape that is generally 3 to 4 square yards/meters. This type of bed is useful in wet climates or during the rainy season because it enables good drainage and prevents plants from being damaged by waterlogging. These beds permit deep root growth and increased plant density and are highly productive. Because the soil in the bed is not disturbed by equipment or human or animal traffic, there is a reduced risk of soil compaction. Raised beds can be framed or unframed. If framed beds are promoted, make sure that materials used for frames are non-toxic.

Sunken beds

Sunken beds.
Photo courtesy of Terrie Schweitzer, licenced under CC BY-NC-SA 2.0)

Sunken beds are dug into the ground and therefore lower than the surrounding area. This is done to maximize water use. They are generally used in arid climates or during the dry season because they conserve or divert water, alleviate water runoff, and create a microclimate that helps keep plants moist, cool and protected from wind. When preparing these beds, it is important that the soil is prepared and amended in a loose manner (aerated) to allow for greater pore space. Sunken beds are often the preference for plants in nurseries that will later be transplanted to raised beds in the rainy season.

Conventional row gardens

Conventional row garden.
Photo courtesy of Paulo O, licenced under CC BY 2.0.

These are larger gardens that often use irrigation. Plants are more widely spaced than in sunken or raised beds and therefore compete less for nutrients and sunlight. But, given the wider space, weeds are more of a concern than in other garden types. The soil is subject to compaction due to movement around the garden. These gardens permit the use of larger tools, equipment or animal traction.

Keyhole gardens

Keyhole gardens.
Photo by CRS staff

Keyhole gardens are compact raised bed gardens, often waist-high, constructed with layers of organic material inside stone walls, to improve water retention and soil fertility. Keyhole gardens were designed to be used by people with limited mobility (e.g., the elderly, people with disabilities or people living with HIV), because once they are constructed, they are easy to manage—requiring no bending over and relatively minimal maintenance. If promoting keyhole gardens to PWD, consider adapting the garden design to accommodate the disability, such as a wider keyhole or lower walls if a person is in a wheelchair.

Permagarden

Permagarden.
Photo by Thomas Cole

A permagarden consists of raised or sunken beds that are surrounded by swales (ditches) and berms (small hills) to improve soil health and water management. It is designed to optimize the use of available resources and build resilience to environmental stresses.

Container gardens

A hanging garden and a sack garden. *Photos by Anza Muenchow*

Container gardens are simply containers filled with high-quality soil and compost. This garden can increase the area available in constrained spaces, including urban or peri-urban areas. Containers must have proper drainage, and should be placed where they receive adequate sunlight and water, and will not be damaged by strong winds or heavy rains.

Vertical/multi-level gardens

Vertical garden. *Photo by Anza Muenchow for CRS*

Vertical gardens are especially good for maximizing constrained spaces, since plants can grow vertically, not just horizontally. This garden type uses trellises, nets, strings, cages or poles to support growing plants as well as plants grown in suspended mediums. Suspending plants can also help avoid potential animal damage.

Figure 2: Land needs per garden type

Large parcel

Conventional row garden

Medium parcel

Raised beds
Sunken beds
Permagarden

Small parcel

Container garden
Vertical garden
Keyhole garden

Action

- Use Table 6 in the *Garden Project Design Worksheet* to identify the type of garden(s) the project will promote?

Table 1: Types of gardens: Summaries

Type	Land size	Climate/ location/use	Labor requirements	Water resources	Suitable crops	Materials (besides basic tools)	Advantages	Constraints
Container	Small	Urban area/ landless	Minimal effort to establish and maintain. Requires regular attention to water needs.	Requires close attention to soil moisture.	Any crop is suitable as long as it has ample space. Ensure containers of appropriate size are used.	Non-toxic containers; soil mixture consisting of sand or gravel, soil and generous amounts of compost	Use where there is limited space or soils are unsuitable or not cultivable (rocky, infertile, contaminated, rooftops, bricked areas, etc.); requires little labor or purchased resources, and recycled materials can be used for containers	Limited production so may not produce sufficient vegetables to meet household needs. May require frequent watering, especially if placed inside, or on verandas or other covered places.
Conventional row	Medium/large	Rural	Minimum effort to establish. More difficult to maintain as garden is larger and there will be more weeds.	Varies depending on soil quality and type. Large area may require significant time for watering.	Suitable for most crops and can be integrated with agroforestry systems (e.g. fruit trees).	Best used with mechanization, such as pump or drip irrigation, motorized tillers, animal traction and others.	Larger fields allow for staggered planting. Greater production may permit surplus to be sold for income generation.	Not intensive so requires more land to produce same volume as intensive production. Because of greater distance between plants, needs weed management.
Keyhole	Small	Semi-arid climates; dry season; location with rocky, difficult-to-cultivate or infertile soils; limited space	Medium effort to difficult to establish as many materials are required. Easy to maintain.	Designed for moisture retention. Uses greywater.	Suitable for root crops, leafy crops/greens, carrots, beets, garlic, herbs. Unsuitable for peppers, eggplant, maize and large/vining plants.	Stones, manure, ash, rotting logs, dry and green grass or leaves, other available organic materials, woven basket.	May be physically appropriate for those with disabilities.	May need to establish multiple keyhole gardens to meet household consumption needs. Some materials may be difficult to access.

Type	Land size	Climate/ location/use	Labor requirements	Water resources	Suitable crops	Materials (besides basic tools)	Advantages	Constraints
Permagarden	Medium/large	All seasons, but especially suitable for dry season	Medium effort/ difficult to establish as careful attention must be given to the construction. Medium maintenance effort as it requires close attention.	Designed for moisture retention and flood control.	Suitable for all crops.	Hoes, *pangas*/ machetes; 4 watering cans; containers to carry manure, ash, etc.; 4 empty maize seed bags (100 kg); manure, wood ash, charcoal dust; 6–8 jerry cans for water; vessel to hold a bag of manure or chopped leaf material suspended in water; fencing material; nails (1 kg); hammer; twine; bamboo or sticks used to make an A-frame.	Designed to address soil and water constraints. If designed correctly, will optimize use of water and soil nutrients even in the face of drought or other climate shocks.	Uses primarily perennial crops (bushes and trees) and fewer annual crops. The design stage is more intensive than some of the other gardens described. Maintenance will likewise require more time, care and attention from the gardener.
Raised bed	Small/medium	Moist climates or during the rainy season.	Medium effort required to construct the garden. Easy to maintain. Weeds are minimal.	Good drainage, but may need frequent watering in the dry season.	Most plants grow well, but shallow-rooted plants are preferred, such as vegetables, herbs and berry bushes. Large vining plants will take up space. Stake/trellis may be used to reduce space needs.	Frames are not required. If using frames, they can be made out of concrete block, bricks, stone, nylon sacks, etc. Wood is not recommended because it rots easily. Tires should not be used as they may be toxic.	Size is determined by gardener to accommodate available labor, space and food needs.	In arid, dry climates, the soil may get too hot and dry out.

Type	Land size	Climate/ location/use	Labor requirements	Water resources	Suitable crops	Materials (besides basic tools)	Advantages	Constraints
Sunken bed	Small/medium	Dry areas, dry season, nursery.	Medium effort to establish given double digging. May be more difficult to maintain for those with disabilities or chronic illness as crouching is required.	Designed for moisture retention as it limits water runoff and serves as a water catchment system. Maximizes use of available water found deeper in the soil.	Suitable for all crops, except roots and tubers due to the depth required for optimal growth.	Organic matter/ compost.	Supports rebuilding soil health and keeps roots cool in hot climates.	Not suitable for areas prone to flooding or heavy rains, or for soils with poor drainage. Nearby erosion may fill in the bed.
Vertical/Multi-level garden	Small	Urban area/ landless	Minimal effort to establish and maintain. Requires regular attention to water needs.	Because garden is compact with less soil, frequent watering is likely needed. Water needs to be distributed evenly. Simple drip irrigation is needed if garden is larger.	Trellises are suitable for vining and sprawling plants, such as cucumbers, peas, tomatoes, melons and pole beans. Suspended containers or poles may be used to support leafy greens or herbs.	Can be made of trellises, nets, strings, cages, poles, suspended containers, sacks, bamboo, etc. Nutrient-rich soil needed.	Maximizes constrained space and permits gardening in areas with unsuitable soils (poor, rocky, hilly, etc.). Can help prevent crop damage by animals if hung out of their reach.	Limited production to meet homestead needs. Because of the limited amount of soil used, it must be very fertile to meet plant needs. Plants need to be closely monitored for nutrient stress, and compost should be added regularly. If containers are elevated, irrigation can be difficult when lifting is required.

STEP 5: DETERMINE CROPS TO PROMOTE IN THE GARDEN

The choice of crops promoted in a garden intervention is influenced by a number of factors such as the garden outcome(s), garden type, food preferences, gender preferences and workload, soil health, seed availability, water requirements, and pest/disease prevalence. Below is a brief description of these factors (Table 3 summarizes these for selected crops). To support this decision process, the Technical and Operational Performance Support Program's *A Tool For Framing A Discussion Between Nutrition and Agriculture Specialists* is useful. A CRS-adapted version of the Excel sheet is also available here. Identifying major crops that the project will promote is important during the design phase so technical and financial support can be properly planned.

Nutrition outcome: If the garden outcome is to address malnutrition, select crops that meet the nutrient deficiencies identified in Step 1. This may include crops that are nutrient-dense in either vitamin A, protein, iron, vitamin C, and/or zinc. This is an opportunity to explore indigenous vegetables and biofortified crop varieties such as orange-fleshed sweet potato (OFSP).

25,000 gardens for dietary diversity

Seguridad Alimentaria Enfocada en los Primeros 1,000 Días (SEGAMIL)—CRS Guatemala's DFAP—established close to 25,000 home gardens from 2014 to 2018. The project prioritized the use of gardens to increase the dietary diversity of families and the availability of leafy greens to pregnant and breastfeeding women. One of the key lessons in this work was to emphasize the use of native vegetables, such as *chipilín* (*Crotalaria longirostrata*), *epazote* (*Dysphania ambrosioides*), *hierba mora* (*Solanum nigrum*), amaranth (*Amaranthus cruentus*), *Q'ixtán* (*Solanum wendlandii*), and others. Every 25-square-meter garden needed to have at least four native species as there were several benefits to promoting native vegetables:

- Native plants were more drought-tolerant and pest-resistant
- They were easy to grow, serving as an entry point for those families unfamiliar with gardening
- Most plants were perennial (regrow every year) and produced during the dry season
- Family members, especially grandmothers, tended to know how to cook with them
- They were rich in iron, vitamin A and other key nutrients
- Indigenous seeds were widely available

Marketing outcome: If the desired garden outcome is twofold—produce food for the household and sell surplus produce—an understanding of market demand is essential to help drive decisions on what crop mix to promote. Typically, market vendors want a mix of vegetables—not just one product. The market assessment conducted in Step 1 will help determine the best crop mix, the most valued varieties, volume needs, and sale prices. The final criteria for selecting the appropriate crop mix for the market is profitability.

Small business opportunity outcome: Again, the crop mix needs to be driven by market demand. Typically, produce from these gardens is not sold at a market stall or on the roadside, but goes directly from the garden to the buyer or cooperative.

Food preferences: Understanding what food the end user likes to eat is a critical input into crop selection. Without understanding these preferences, crops or certain varieties may be promoted that are not liked and therefore not consumed. If the design team decides to select crops that are not typically consumed by the target audience, then behavior change on their adoption by the gardener and the consumer needs to be planned and budgeted.

Water requirements: For most gardeners, access to an appropriate quantity of water will be a limitation. Knowing what water is available and the water requirements for each crop can guide the design team in selecting crops to promote. For example, if the project is located in an area with very limited water and with no delivery system to the garden, the project may want to promote crops that require less water, or only need water at strategic times, such as orange-fleshed sweet potato. Otherwise, consider supporting a water delivery system for gardens.

Gender preferences: Men's and women's preferences for crop and variety need to be considered to ensure adoption and use. It is also necessary to understand the gender dynamics for each crop to ensure the target audience benefits from their efforts and to ensure there is not a shift in control if the garden crop becomes profitable. For example, if you are targeting women for this intervention, you would want to understand who controls the use of the harvest and/or income. Be sure to consider the work required to grow each crop and understand the impact on gardeners' workloads.

Seed selection: The availability, accessibility and affordability of seed, along with the ease of seed-saving between production seasons, should influence decisions on which crops to promote. The Seed System Security Assessment, if available, will provide information on what seed varieties are available and how gardeners access specific varieties.

When considering seed variety, the project may want to consider varieties that are drought and/or disease-resistant as well as being appropriate for fresh consumption or processing. For nutritional and marketing aspects, varieties with short maturity, different harvest times, and staggered ripening may be considered depending on the context. If seed-saving is an important part of the project strategy, then understanding the ease of saving seeds from season to season is important. If seed is not available or affordable, then the project will need to find ways of improving access to this seed and ensuring acceptability by the gardener and final consumer. The project should plan to work with agro-dealers to explore ways of getting quality seed to target communities.

Soils: The type of soil (relative amounts of sand, silt and clay), overall soil health, and soil pH will influence the types of crops the project recommends to gardeners since certain crops grow better in different types of soil and at different pH ranges.

Temperature: The temperature across a season's growing period can affect seed germination and crop productivity. To understand which crops do well in your project's temperature zone, use the USDA Hardiness Zones. The index is used to group areas with similar minimum or maximum temperatures (cold and heat zones respectively).

Companion planting: When considering which crops to promote, it is important to understand whether the crops are compatible with each other and how they can support each other's growth and health. Compatible crops can attract beneficial insects or repel pests; make soil nutrients available; and provide shade, staking or ground cover.

Garden type: As seen in the previous step, certain crops are suitable for different contexts. Ensure that the crops selected align with the garden type(s) the project decided to promote.

Action

- Use Table 7 in the *Garden Project Design Worksheet*, to determine the crops/varieties the project will promote to meet the intervention outcomes and local context?

See Table 3, Summary of key factors affecting selected crops,[4] on Pages 17 to 20.

4. **Crop water needs**: Brouwer C and M Heibloem. 1986. Irrigation water management: Training manual No. 3. FAO. **Soil type and pH levels**: FAO. 2014. A vegetable garden for all | FAO. 1995. Improving nutrition through home gardening: A training package for preparing field workers in Southeast Asia. **Nutrient content**: Gibbon D. 2010. African indigenous vegetables in urban agriculture. CM Shackleton, MW Pasquini and AW Drescher, eds. Earthscan. Centers for Disease Control. Fruit and Vegetables: Nutrition facts. State of Indiana. **Companion crops**: Ladwig-Cooper S. Decenber 2, 2011. Companion Planting Information and Chart. Permaculture Research Institute. Perishability: Kitinoja L and AA Kader. 2003. Small-scale postharvest practices: A manual for horticultural crops, 5th edition. University of California, Davis.

Table 3: Summary of key factors affecting selected crops

Crop	Ease of saving seed	Soil type best for the crop[1]	pH level preferred by the crop	Average crop water needs (mm/ total growing season)	Contains high levels of the following nutrients	Non-compatible crops	Perishability (very high: <2; high: 2–4; moderate: 4–8; low: 8–16; very low: >16)
Amaranth	Easy	Many soils	5.5–7.5	–	Vitamin A, iron, zinc	–	Very high
Avocado	N/A	Many soils if well drained	Tolerates 5.0–7.0 Prefers 6.0-6.5	–	Folate, zinc	–	High
Banana	–	Many soils if deep, well drained	5.5–6.5	1200–2200	–	–	Very high
Beet	Difficult	Loam or sandy soils, not clay soil	6.0–7.5	–	–	Mustard, pole beans	Moderate
Broccoli	Difficult	Many soils if well drained	6.0–7.0	–	Vitamin C	Cabbage, cauliflower, lettuce, pole beans, tomatoes	Very high
Cabbage	Difficult	Sandy loam to clay soil	6.0–7.0	350–500	Vitamin C	Broccoli, cauliflower, strawberries, tomatoes	Low
Carrot	Difficult	Sandy soil	5.5–7.0	–	Vitamin A	Dill, parsley	Moderate
Cassava	Vegetative propagated crops (VPC)	Sandy soil	5.0–8.0	–	Iron (leaves)	–	Very high
Chickpea	Easy	Well-drained loam and clay loam soils	5.0–9.0	–	Protein	–	Very low (dried)
Chili pepper	Easy	Sandy soil	5.0–6.5		Vitamin C	–	High
Chinese cabbage	Difficult	Sandy loam	6.0–7.5	–	–	–	Moderate
Citrus	Tree	Loam, sandy loam or sandy soils	Tolerates 4–8 Prefers 5.5–7.0	900–1200	Vitamin C, folate	–	Moderate
Common beans	Easy	Sandy loams or silty loams are best; can grow in any soil except clay	Tolerates 5.5–7.5 Prefers 6.0–6.5	–	Protein	Garlic, onions, peppers, sunflowers	Very high
Cowpea	Easy	Many soils, but does best in sandy or sandy loam soils	5.5–7.0 Does not do well at 7.5 or higher	–	Protein	–	Very low (dried)

1. The best soil for most vegetables is a loam.

Crop	Ease of saving seed	Soil type best for the crop[1]	pH level preferred by the crop	Average crop water needs (mm/ total growing season)	Contains high levels of the following nutrients	Non-compatible crops	Perishability (very high: <2; high: 2–4; moderate: 4–8; low: 8–16; very low: >16)
Cucumber	Easy	Loam soils are best	Tolerates 5.5–7.6 Prefers 6.0–7.0	–	–	Herbs, melons, potatoes	Very high
Eggplant	Difficult or moderate with training	Sandy soils, not clay soil	Tolerates 5.5–7.0 Prefers 6.3–6.8	–	–	–	High
Garbanzo beans	Easy	Well-drained loam or clay loam	6.0–9.0	–	–	–	Chickpeas
Garlic	VPC	Sandy soil	5.5–8.0	–		Peas and beans	Low
Gourd	Easy	Many soils, but loams are best	5.5–7.5	–	Vitamin C	–	Very low
Guava	N/A	Many soils	4.5–8.2	–	Vitamin C (ripe)	–	High
Groundnut	Easy	Sandy soil	6.0–6.5	–	Protein, iron	–	Very low (dried)
Kale	Moderate or difficult	Many soils if well drained; prefers loam soils	Tolerates 6.0- 7.5 Prefers 6.5–6.8	–	Vitamin A	Strawberry, tomatoes	High
Lablab bean	Easy	Many soils if well drained	4.5–7.5	–	Protein	–	–
Lettuce	Moderate	Sandy soil	6.0–7.0	–		Broccoli	Very high
Lentils	Easy	Deep, sandy loams; needs good drainage	Tolerates 6.0–8.0 Prefers 7.0	–	Folate, protein	–	Very low (dried)
Mango	N/A	Many soils	–	–	Vitamin A (ripe)	–	High
Melon	Easy	Sandy soil	> 5.0	400–600		Cucumbers, potatoes	High
Moringa	–	Sandy loam to loam	Tolerates 5.0–9.0 Prefers 6.5–7.5	–	Protein, vitamin C, vitamin A	–	Leaves very high, seeds very low
Mung bean	Easy	Sandy loam	6.2–7.2	–	Protein, folate	–	Very low (dried)
Mustard	Easy	Sandy or sandy loam	5.5–6.8	–	Vitamin A, vitamin C	–	Seeds very low
Okra	Easy	Sandy soil	6.5–7.6	–	Folate	–	High
Onion	Difficult	Sandy soil	5.5–6.8	350–550	Vitamin C	Beans, peas, sage	Low (dry)

Crop	Ease of saving seed	Soil type best for the crop[1]	pH level preferred by the crop	Average crop water needs (mm/ total growing season)	Contains high levels of the following nutrients	Non-compatible crops	Perishability (very high: <2; high: 2–4; moderate: 4–8; low: 8–16; very low: >16)
Papaya	–	Many soils	5.5–6.6	–	Vitamin A (ripe), folate	–	High
Pea	Easy	Clay soil	6.0–7.5	350–500	Vitamin K, manganese, thiamin, copper, vitamin C, phosphorous, folate	Garlic, onions	Very high
Pepper	Easy	Medium clay soil	5.5–7.0	–		Beans	High
Pigeon pea	Easy	Sandy soil	5.5–6.5	–	Protein	–	Very low (dried)
Pineapple	VPC	Sandy soil or loams	4.5–6.5	–	Vitamin C	–	High
Plantain	VPC	Loams	4.6–7.8	–		–	High
Potato	VPC	Sandy or well-drained soils	4.8–6.5	500–700		Cucumbers, melons, squash, sunflowers, tomatoes, turnips	Moderate (immature); low (mature)
Pumpkin	Easy	Sandy soil	5.5–7.5	–	Vitamin A, zinc (seeds)	Potato	Low
Radish	Easy	Sandy soil	6.0–7.0	–		Potato, hyssop	Moderate
Regionally important/ traditional greens	Easy	–	–	–	–	–	Very high
Soybean	Easy	Well-drained soil, but not sandy soils	6.0–7.0 Ideal 6.3–6.5	450–700	Protein, zinc	–	Very low (dried)
Spinach	Moderate; some varieties need long days to produce seed	Many soils, but prefers sandy loam	Tolerates 6.0–7.5 Prefers 6.4–6.8	–	Zinc	–	Very high

Crop	Ease of saving seed	Soil type best for the crop[1]	pH level preferred by the crop	Average crop water needs (mm/ total growing season)	Contains high levels of the following nutrients	Non-compatible crops	Perishability (very high: <2; high: 2–4; moderate: 4–8; low: 8–16; very low: >16)
Squash	Easy	Sandy soil	5.5–7.0	–	–	–	High (summer); low (winter)
Sweet potato (orange)	VPC	Many soils; prefers fine sandy loam or well-drained clay loams	Tolerates 4.5–7.5 Prefers 5.8–6.2	–	Vitamin A	–	Low
Taro	VPC	Clay oil	–	–	–	–	Low
Tomato	Difficult or moderate with training	Loams and sandy loams; not clay soil	Tolerates 5.5–7.5 Prefers 6.0–6.8	400–800	Vitamin C	Broccoli, brussels sprouts, cabbage, cauliflower, corn, kale, potatoes	Very high (ripe); high (partially ripe)
Watermelon	Easy	Many soils, but prefers sandy loams	5.5–6.5	–	–	–	High
Yam	VPC	Many soils, but prefers a sandy clay loam	5.5–7.0	–	–	–	Low

STEP 6: DETERMINE ADDITIONAL ACTIVITIES AND FINANCIAL SUPPORT NEEDED FOR SUSTAINABLE GARDENS

The first five steps of this process support the design team in laying the foundation to the garden intervention. However, to ensure that gardens are successful and sustainable, the design team will need to consider, based on the local context, what additional technical and financial support is needed for sustainable gardens and the ability to scale gardens. A list of interventions, tools, technologies, and approaches related to gender integration, nutrition, marketing, soil health, integrated pest and disease management, seed supply, water resources, and postharvest storage and processing are listed in Table 8 of the *Garden Project Design Worksheet* to guide this decision. When considering what additional support the garden will need, engage CRS technical staff from relevant sectors (agriculture, nutrition, water, gender, and behavior change) and read as necessary Chapters 5 to 13 of the *Garden Resource Guide.*

Actions

- Use Table 8 in the *Garden Project Design Worksheet* to identify support activities to gardens
- Identify who will provide technical advice and implement the support activities.

STEP 7: DETERMINE THE SCALE AND FINANCIAL FEASIBILITY OF THE GARDEN INTERVENTION

For any project, sizing the intervention is important for managing staffing needs and financial cost. However, the garden intervention design and scale will be based on the local context. For example, in Burkina Faso, the project developed large (3-hectare) community gardens next to a river that were then divided into 10-meter-square plots for each person. This intervention included motorized year-round irrigation and supported 30 to 40 women. In Lesotho, community members were provided with basic support for gardens and were each given a voucher to use at the seed fair to buy a range of seeds to grow a basket of vegetables.

The project design team will use an iterative process to determine staffing needs (Annex 2) and budget requirements (Annex 3) to support the implementation and scaling of gardens. To determine the number of field agents across sectors, the project design team can initially estimate the number of garden participants (e.g., 30,000) it will reach with this intervention and its associated support activities. After estimating the total number of gardening participants, it will then calculate the number of trainings (e.g., garden establishment and management, soil testing, pest management, marketing basics, cooking demonstrations, processing techniques, and storage technologies), meetings, and associated activities that are required to complete the trainings and interventions proposed (review Steps 4 and 5 above).

Given the role of different sectors in the garden intervention, classify which project manager or volunteer will support the trainings, meetings and other associated activities. Taking into consideration factors such as the distance, means of travel, number of days in the field, and days per month reporting back to the M&E coordinator and program manager, the design team can calculate how many field agents per sector are required to ensure that 30,000 women in 1,200 groups receive one visit per week for a certain period of time to ensure all trainings, meetings, associated activities and data collection are conducted. This could mean that one field agent could assist eight groups with 25 women per group (total of 200 women); therefore, the design needs to calculate resources for 150 field agents, along with their training materials, supplies and transport. An example of a staff requirement spreadsheet that can be used to calculate the number of field agents required to complete gardening interventions/ training can be found in Annex 2.

After determining the number of field agents from each sector needed, the project design team needs to estimate the costs associated with the garden intervention. To get a comprehensive figure, the design team should look back at Steps 4 and 6 to ensure that **all activities** are included in the budgeting process as appropriate. The design team can determine the cost of supporting activities per group based on the number of projected field agents and other costs. A budget template (Annex 3) with the selected activities can help you calculate the cost of the garden interventions. Be sure to include all garden-related activities. After determining costs, the design team can reaffirm the total number of clients who can receive the garden intervention and associated support activities. The design team can readjust total clients reached based on budget projections.

If the gardening intervention is for commercial or small business development purposes, it is paramount that the design team calculates the cost benefit of the commercial garden based on local knowledge of input and labor costs and estimated market price points for the produce. An example of a cost–benefit analysis (Annex 4) for two crops is available here. This spreadsheet assists in gathering information for cultivating a hectare and calculates the production cost, income, expenditures, net benefit and cost benefit ratio.

Actions

- Calculate the total number of beneficiaries to reach
- Calculate the number of field agents per sector needed to meet beneficiary targets
- Calculate the budget to support garden intervention
- Calculate the cost–benefit if the desired outcome is income-oriented

STEP 8: MONITOR PERFORMANCE AND DETERMINE INDICATORS

Performance monitoring that connects indicators to the program results framework gives project staff access to real-time information on outputs and associated results. Including qualitative data helps implementing teams understand how and why change is happening. The combination of this information helps implementing teams make informed changes to program design and ensures emerging needs and challenges are addressed and new opportunities identified and included in a program's activities.

The project design team should use its theory of change or results framework to determine the indicators to monitor garden performance and outcomes. Some suggested indicators for garden monitoring are presented in Table 4.

Actions

- Include the garden intervention and associated activities in the theory of change.
- Decide what indicators will be used to monitor the gardens' performance and outcomes.
- Decide what qualitative data will be collected to monitor performance.

Table 4: Suggested indicators for measuring results in example results framework

Indicator name/ number	Suggested indicator	PIRS/guidance to calculate
Output		
Number of people trained on gardening	Number of individuals who have received USG-supported short-term agricultural sector productivity or food security training (sex and age disaggregated)	2019 Food for Peace Indicator list—page 5
Intermediate results		
IR 1: Increase in the number of households with gardens	Number of individuals in the agriculture system who have applied improved management practices or technologies with USG assistance (sex and age disaggregated)	2018 Feed the Future Indicator Handbook—page 89
IR 2: Increase in diverse food produced in gardens	Yield of targeted agricultural commodities among program participants with USG assistance (changes in quantity)	2019 Food for Peace Indicator list—page 6
	Diversity of food produced on farm, i.e., garden (changes in diversity)	Compendium of indicators for nutrition-sensitive agriculture—page 26
Objectives		
Objective 1: Increase in income from foods produced in the garden	Value of annual sales of producers and firms receiving USG assistance (FFP page 10)	2019 Food for Peace indicator list—page 10
Objective 2: Increase in consumption of diverse foods	Percentage of female beneficiaries of USG nutrition-sensitive agriculture activities consuming a diet of minimum diversity; this indicator can be adapted to include sub-categories reflecting crops being promoted in the garden	2019 Food for Peace indicator list—page 3
	Prevalence of children 6–23 months receiving a minimum acceptable diet	2018 USAID Feed the Future Indicator Handbook—page 161 WHO Infant and young child Minimum Dietary Diversity score

STEP 9: DRAFT PARAGRAPH FOR THE PROPOSAL

A substantial amount of information has been decided through the worksheet that accompanies this guide. All decisions are important to guide the design, including staffing and financial resources needs, but not all information will be in the proposal. The last step in this process is to consolidate the information from the worksheet into a succinct, clear paragraph for the proposal. Below is an example of a paragraph that could be included in a project proposal.

"Project X will promote raised beds to very poor households with children under 5 and pregnant and lactating women who are at least in the contemplation stage of behavior change, have access to water, and live on plots of 1 hectare or more. To address nutrient deficiencies and dietary diversity gaps in foods with vitamin A, vitamin C, and iron, Project X will promote the following crops that women manage and maintain control of: orange-fleshed sweet potato, amaranth, groundnut, mangos, tomatoes, onions and cabbage. Project X will provide technical assistance in soil testing and composting, integrated pest management, clay pot irrigation during the dry season, seed-saving/root storage (amaranth, groundnut and orange-fleshed sweet potato), crop maturity, harvesting, and postharvest practice to mitigate crop loss and aflatoxin growth. Project X will work with Y Vegetable Seed Company and agro-dealers to bring affordable, quality onion, cabbage, tomato and OFSP seed to Project X beneficiaries, and with Z Nursery to supply mango trees and teach beneficiaries how to save groundnut seeds. Some 1,200 demonstration gardens, along with cooking demonstrations and nutrition messages, will reach 30,000 beneficiary families. Project beneficiaries will contribute their personal time to building and maintaining the garden, make compost, use their tools, and buy their own seed by year 4."

Annex 1: Dietary diversity score indicators

Indicator	Data level	Description	Calculation sources
Average Household Dietary Diversity Score (HDDS)	Population	Uses a 24-hour recall period but does not include meal frequency information. There are seven food groups and each group represents 1 point in a dietary diversity score. Proxy for household-level access to food.	https://www.fantaproject.org/monitoring-and-evaluation/household-dietary-diversity-score
Minimum Dietary Diversity for Women of reproductive age (MDD-W)	Population	Developed as a proxy indicator to reflect the micronutrient adequacy of women's diets. Measures whether women have had a minimum of 5 out of 10 food groups. It cannot be used to describe diet quality for an individual woman because of day-to-day variability in individual intakes (FAO and FHI 360 2016)	http://www.fao.org/3/a-i5486e.pdf https://www.usaid.gov/sites/default/files/documents/1866/Part%20I_Baseline%20and%20Final%20Evaluation_04.13.2015.pdf
Minimum Acceptable Diet (MAD) for children aged 6–23 months	Population	This combines two indicators: Those children who meet minimum dietary diversity (4 out of 7 food groups) and minimum meal frequency (minimum depends on a child's age).	https://inddex.nutrition.tufts.edu/data4diets/indicator/minimum-acceptable-diet-mad https://www.usaid.gov/sites/default/files/documents/1866/Part%20I_Baseline%20and%20Final%20Evaluation_04.13.2015.pdf

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