Nature-based Solution protocols

Resilient gardens

The resilient garden is a plot of land used for the cultivation and harvesting of food and can become a teaching and learning space in schools. It's characterized by a small size rich in flowers and shrubberies, which provide vegetables, aromatic herbs and fruits. They are implemented with an agroecological strategy, that involves food cultivation practices without environmental deterioration. It can also be adapted to limited conditions of water availability and include a drip irrigation mechanism, and in some cases, rainwater harvesting systems.

Integration with international agreements

Sendai: Goal 3 – strengthening inclusive policy implementation through community engagement to improve livelihoods.

Duration

The **installation** of a resilient garden can be carried out in a period of 4 to 6 months, from the selection of the site to the process of training, sowing, managing the cultivation and harvesting of the products.

Its **operability** can be long-lasting, based on the adequate crops' monitoring and the community organization for its sustainable management.

Place of implementation

It requires a minimum area of 24 m2 if implemented in schools. It can take larger dimensions in peri-urban and rural areas, depending on the beneficiaries needs and management capacities. Smaller gardens are not considered under this protocol.

Beneficiaries (~#)

The beneficiaries should be a group of a collective scale, considering this action aims at generating community participation. The number of beneficiaries depends on the size, diversity of species and number of crops.

Threats Addressed

Drought

Social and economic co-benefits

Increasing inputs available

- Savings on food purchases.
- Use of an available and unused area.
- Simple implementation and low maintenance costs.

Social cohesion

- Community participation, through a learning-and-doing training process that allows beneficiaries to be directly responsible for the management of the orchards.

Education

- It is a good experience to showcase ecosystem services and climate resilient livelihoods in the school and community.

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Main climate impacts addressed

Reducing food security

The resilient gardens become a source of food supply for the community. Through crop diversification, food can be obtained throughout the year.

Loss of productivity

It provides a sustainable production system through the system's resilience that distributes losses in the event of extreme events due to rain or heat.

Need for more inputs

For a community consumption, the product's price is diminished as the supply chain from harvest to consumption is eliminated.

Spread of pests

With the planting of certain species that function as repellents, the resilient gardens provide a resilient system in case of spread of pests.

Implementation stages

Step 1. Site evaluation

1 **Choosing the place:** a minimum area of 24 m2 is required, preferably a flat ground, with water accessibility and exposure to sunlight. It is recommended to place it near a wall, to protect it from the strong wind. If there's no adequate land, a vertical garden can be established instead: by reusing local materials, both horticultural and ornamental plants can be grown in a vertical wall or pendant structure.

Step 2. Implementation

1 **Protecting the planting area:** it should be fenced with a wire mesh, aromatic plants and green fertilizers, to prevent the arrival of insects or animals that could damage it. For a community garden, as it is a large area, the construction of a fence with perimeter mesh is recommended.

2 **Provision of materials, inputs and local seeds:** with due anticipation, materials and inputs of the area should be collected, such as sand, black earth, leaf litter, ash, poles or rods for tutors and native seeds among others.

3 **Elaborating organic fertilizers:** this should precede the sowing of the different crops, for a timely incorporation when the soils are being prepared.

4 **Preparing the planting area:** It is necessary to create a soil with the right nutrients for plants to grow healthy and consistently. The ideal dimensions are 2 m long, 1 m wide and 60 cm deep, with corridors between each planting area measuring between 40 and 50 cm. The length of the planting area however depends on the available land.

5 **For the soil conditioning of the planting area, the double excavation process should be carried out:** it consists of loosening the soil, cleaning, applying lime or ash, sand, compost or natural fertilizers and soil mixture, to improve the texture and structure, and thus optimize fertility.

6 **Constructing seedlings:** for certain species (such as lettuce or tomato), it is necessary to plant the seeds in small seedlings before being transferred to the resilient garden. These are a tabletype structure where trays or other types of small containers are placed to plant the vegetable seeds, where the seedlings will grow. The seedbeds should be kept in such a way as to avoid rain, sun and direct wind and they should have protection against animals.

7 **Planting species of direct-seeding:** vegetables such as cucumber[1] , green bean[2] , pumpkins[3], radishes[4] , etc., do not need to go through the seedling stage so they are sown in the planting areas of the resilient gardens directly. Many or most of these can be planted in bags, pots or another type of container that guarantees positive root development.

8 **Planting species of indirect-seeding:** once the seedlings plants are ready, they can be moved to the resilient gardens too. The ideal timing depends on each species; for example: when lettuce has 4 to 5 leaves and when the tomato is 10 to 15 cm tall.

Phase 3. Maintenance

1 **Irrigation:** with the objective of adapting to climate change, the resilient garden optimizes the use of water and suggests the application of ideal techniques to supply the necessary amount of water avoiding its waste; therefore, a drip irrigation system should be implemented that allows for the humidity of the substrate to adequately supply the plant.

2 **Thinning:** it consists of removing the weakest plants and those that are too close, leaving a space of 5 to 7 cm between them. This work is done with direct-seeded vegetables.

3 **Tutoring:** it is done with some vegetables that need support, to avoid the contact of fruits or foliage with the soil (tomato, cucumber).

4 **Control of harmful insects and diseases:** with the objective of avoiding pests and potential damages to the crops to such a degree that they could affect their production, several technics of integrated management can be used, such as traps, crop rotation, barriers, planting of resistant varieties and use of plant extracts.

5 **Harvest:** if about 10 species are developed and sown in a staggered manner, harvesting would be continuous.

1. Cucumis sativus
2. Phaseolus vulgaris, also known as green beans or kidney bean.
3. Cucurbita argyrosperma
4. Cucurbita moschata

Costs and inputs[5]

Description	School[6], With drip irrigation system with 1,100-liter tank (US$)	Community[7], with drip irrigation system with 2,500-liter tank and rainwater harvesting system (US$)
Tools[8]	**172.50**	439.00
Inputs [9]	**75.00**	288.00
Materials[10]	**32.50**	**161.50**
Drip irrigation system (includes 1 inch PVC pipe,irrigation tape, connectors and filter)	**350.00**	**750.00**
Water harvesting system (roof, gutter and pipe)	**N/A**	**300.00**
Total	**630.00**	$1,938.50

Indicators

Implementation	• Number of resilient gardens installed • Number of harvests obtained during the • Implementation period • Production obtained per unit area (kg/m^2)
Quantitative impact	• Percentage of food used for school or family consumption (kg) • Presence of pollinators at the site of resilient garden • Rate of involvement of girls and women in the implementation of the garden • Number of people who request inputs and • Information to replicate the gardens

References

Ministry of Education, 2018. Agreement 15-0145 Guidelines for the implementation of school gardens.

FAO, MUDE SEA 2009 The school garden as a teaching learning resource for the subjects of the basic education curriculum.Food and Agriculture Organization of the United Nations-FAO Santo Domingo, Dominican Republic, October 2009.

FAO 2009 The School Garden Guidelines for Implementation, Ministry of Education, Government of El Salvador.

Jiménez Diego 2014 School Garden project, IES EGA, San Adrián (Navarra), Spain.

5. The amount is calculated for a garden of 50m^2. it is considered for the effective implementation of an ecological garden, hiring the services of a professional in the field who provides advice and training in the development and application of organic fertilizers and repellents and garden management.
6. Is calculated for an area of 500 m^2 in the peri-urban area. It does not include the costs of perimeter fencing.
7. It is required: hoe duplex shovel, scissors for pruning, wheelbarrow, a toolkit for the care of the garden, germination tray, machete, atomizer backpack pump buckets, piocha, rake.
8. Seed aquetes, aromatic herb plants, quintals of black earth, quintals of bokashi, quintals of minerals, repellents, or organic insecticides.
9. Material to fence, tie-down wire, hose.