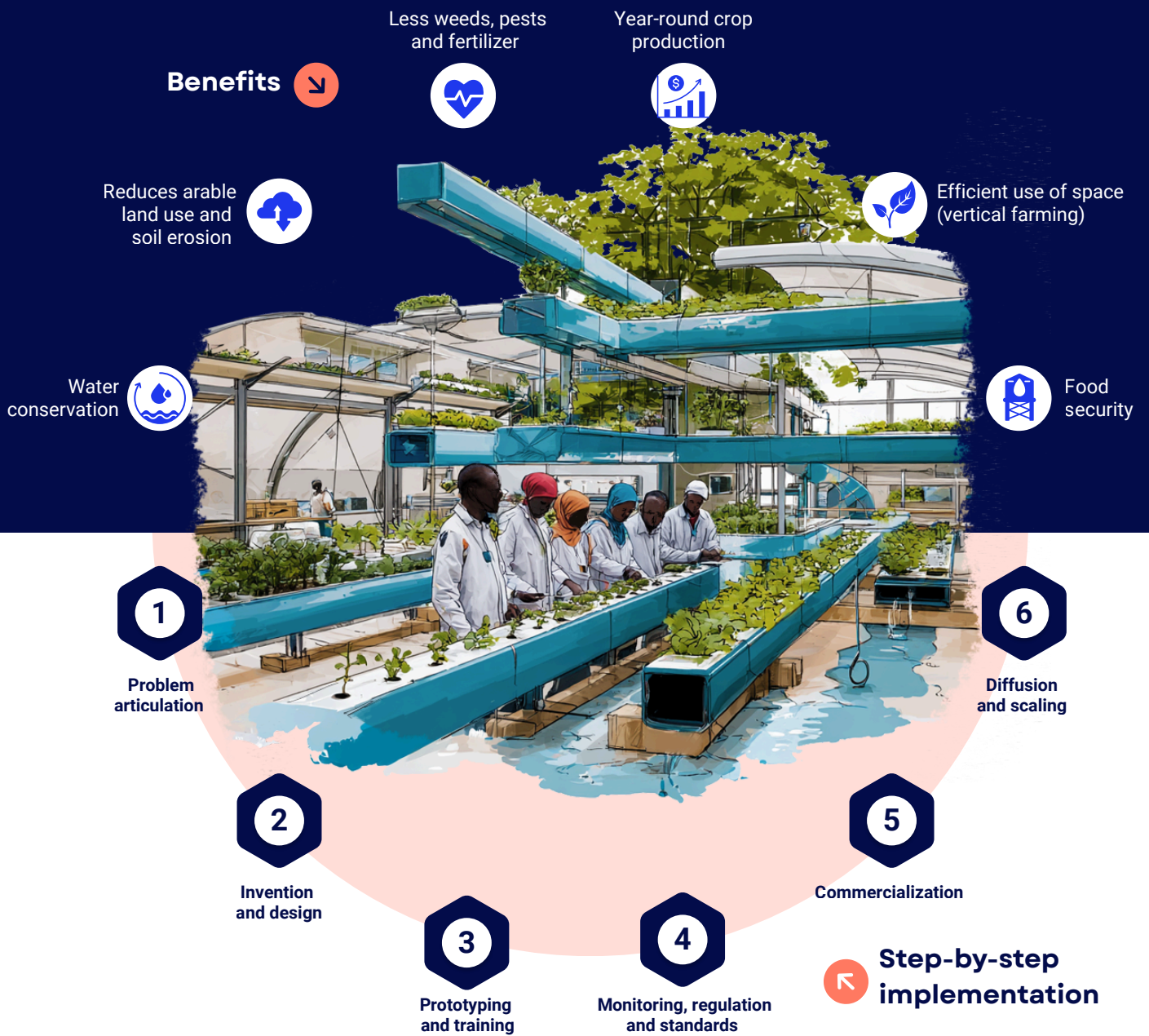


# HYDROPONIC FARMING

Growing food without soil for efficient, climate-resilient agriculture

**Objective:** Climate adaptation and mitigation

**Approach:** Community based | Disaster risk reduction | Ecosystems and biodiversity | Gender



## Hydroponic farming systems

Conventional farming is under mounting pressure from climate change, land degradation, and water scarcity, threatening global food security. Hydroponics offer a climate-smart alternative that can be adapted to different contexts. By producing crops in controlled environments, hydroponic systems reduce exposure to erratic weather and protect production from the disruptions that often affect open-field agriculture.

Hydroponic farming is a method of growing plants without soil. Instead, crops receive all essential nutrients through a water-based solution enriched with soluble fertilizers, with plants supported by inert structures. This method enables precise control over plant nutrition, water use, and growing conditions, leading to faster growth rates and higher yields compared to traditional soil-based farming.

Crucially, hydroponics consumes far less water than soil-based agriculture, making it a valuable solution for drought-prone and desertifying regions. Solar hydroponics are powered by solar energy. While there are different solar hydroponic systems available, the basic components include solar panels, a charge controller and battery, an inverter and equipment such as lights, nutrient reservoirs, pumps and sensors.





Community members, Kaduna State, Nigeria

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# Nigeria

## Hydroponic farming in practice



### Location

Kubau LGA, Kaduna State, Nigeria



### Duration

July 2024 to July 2025 (12 months)



### Implementing partner

Green Habitat Initiative



### National designated entity

National Council on Climate Change



### Project proponent

Kubau LGA, Kaduna State



### Funder

European Union, through UN CTCN



### Other key stakeholders

Kaduna Agricultural Development Agency, Kubau Local Government Authority, Kaduna State Budget and Economic Planning Commission, Kaduna State Ministries of Agriculture and Environment, rural farmer cooperatives/groups, traditional leaders, women farmer groups, youth groups

In conflict-affected regions such as Kubau Local Government Area (LGA) in Kaduna State, Nigeria, agricultural livelihoods are increasingly threatened by the combined pressures of climate change, violent conflict, and economic instability. Traditional farming systems, reliant on predictable weather patterns and open-field cultivation, are under severe strain from recurrent droughts, desertification, and erratic rainfall. These environmental challenges exacerbate resource scarcity, fuelling tensions between nomadic pastoralist communities and sedentary farming communities – a dynamic further inflamed by religious and ethnic divisions and the activities of armed groups. The result is a cycle of insecurity marked by cattle rustling, kidnapping, and banditry, undermining food production and worsening poverty.

**In Nigeria, over 30 million people face acute food insecurity, and over 2 million have been displaced by violence and insecurity.<sup>1</sup>**

*The Empowering Communities with Sustainable Agricultural Systems - Piloting a Small Scale Hydroponics System (EMSAS) project set out to respond to these intersecting crises by piloting a small-scale hydroponics system in Kubau LGA. Through innovative technology and community engagement, the project aimed to enhance agricultural resilience, reduce reliance on erratic weather patterns, and mitigate conflict-driven disruptions to traditional farming practices, ultimately contributing to sustainable development in conflict-affected regions.*

## Hydroponics as a solution

Hydroponics presents a promising solution by reducing dependence on unpredictable weather conditions, especially the erratic rainfall linked to climate change. Its ability to function in controlled environments also protects food production from the disruptions caused by violent conflicts and insecurity that have undermined conventional farming systems. The project undertook a benchmarking exercise comparing Nutrient Film Technique (NFT), Deep Water Culture (DWC), aeroponic and trough-based soilless systems. Considering the local conditions in Kubau, including resource availability, infrastructure, and climate, the NFT and DWC techniques are recommended as the most suitable hydroponic system, and the trough system is recommended as a soilless system. The project prioritized the inclusion of women and youth, recognizing their central roles in household nutrition and community resilience.



Community training in hydroponic techniques

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A fully functional hydroponics system and a community-owned screenhouse have been established under the EMSAS-Hydroponics technical assistance in Anchau, Kubau LGA. Designed to optimize yields and reduce water and nutrient consumption, the facility serves as a demonstration and training hub. The six-week Training of Trainers programme equipped ten local experts (including two women) with the skills to construct and manage hydroponic systems.

These trainers, drawn from artisans, lead farmers, and agricultural extension agents, learned the full production cycle for tomatoes, bell peppers, and lettuce, from nursery preparation to harvest.

Beyond technical training, conflict mitigation and prevention workshops were conducted, recognizing that secure agricultural systems must be paired with strategies to address underlying tensions.

**“Women have been excluded from the agricultural chain, due to vulnerability, security challenges, and mostly because they are not able to own farmlands. And so, when the hydroponic system was introduced to them, they readily accepted it, primarily because it can be practiced in the comfort of their backyards and it is also less labour-intensive”**

– Mustapha Dewu, Head of Programs, Green Habitat Initiative



## Achievements

### 1 Operational hydroponics facility

The largest community-owned screenhouse in the area now produces lettuce, bell peppers, tomatoes, and cucumbers using hydroponic methods.

### 2 Capacity building

69 community members trained in hydroponics (35% women, 70% youth).

### 3 Expert training

10 local trainers certified to sustain and expand hydroponics adoption.

### 4 Conflict mitigation

Workshops conducted to address farmer-herder tensions and resource disputes.

### 5 Scale-up planning

A roadmap has been developed to replicate the model in other areas of Kaduna State.

**“Community-led governance structures like the cooperative societies go a long way in providing opportunities to foster innovations around climate technologies”**

– Mustapha Dewu, Head of Programs, Green Habitat Initiative

# Looking ahead

The EMSAS hydroponics pilot demonstrates that innovative, climate-resilient farming can be effectively implemented in high-risk, conflict-affected environments. By combining technological innovation with community-led capacity building, the project has established a scalable model for food security, economic empowerment, and conflict mitigation.

Future phases will expand hydroponics adoption, strengthen local value chains, and position Kaduna as a leader in hydroponic innovation in Nigeria. In doing so, the project contributes to breaking cycles of conflict and vulnerability, replacing them with systems that promote stability, productivity, and resilience.

The lessons from Kubau show that when agriculture is insulated from environmental volatility and political insecurity, communities can not only feed themselves but also rebuild the trust and cooperation necessary for lasting peace.



## Key considerations and recommendations

Drawing from UN CTCN pilot projects, the following lessons can guide National Designated Entities and other stakeholders in the development and implementation of hydroponic farming solutions:

- 1 Ensure access to finance and inputs** → Provide grants, subsidies, or low-interest loans to offset high start-up and maintenance costs. Facilitate access to affordable hydroponic equipment, quality seeds, and materials to enable widespread adoption.

Deliver structured training programmes covering system setup, nutrient management, pest and disease control, harvesting, and marketing. Establish ongoing technical support through extension services and peer-to-peer learning networks.

- 2 Strengthen technical capacity**

- 3 Engage communities early and continuously** → Work with local leaders, farmers, herders, and civil society to build trust, cultural acceptance, and ownership. Use demonstrations, dialogues, and awareness campaigns to encourage uptake.

Support farmer cooperatives for shared input purchasing, marketing, and market access, improving profitability and resilience.

- 4 Promote collective action**

- 5 Secure infrastructure** → Ensure reliable water supply, sustainable energy, and neutral, accessible sites for demonstration farms.

Select beneficiaries transparently, respecting ethnic, religious, and gender diversity. Provide training in conflict sensitivity and inclusion.

- 6 Foster social cohesion**

- 7 Advance gender equality** → Conduct targeted awareness and sensitization campaigns to promote women's participation, backed by regular gender workshops for leaders and stakeholders.

### References

1. World Food Programme (2025). Nigeria. <https://www.wfp.org/countries/nigeria>. Accessed 12 August 2025.