

INNOVATION PACKAGE AND SCALING READINESS REPORT



VERTICAL FARMING FOR HOST COMMUNITIES IN JORDAN

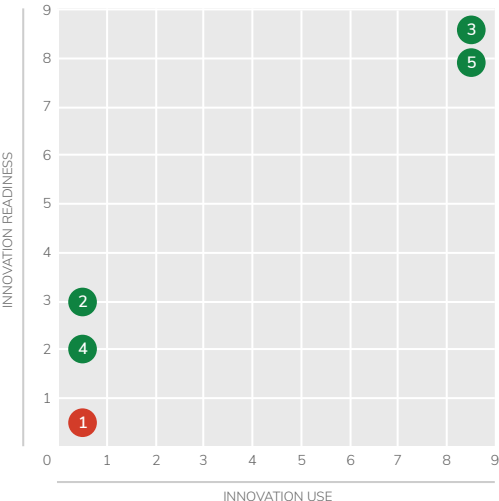
August 2024
1st Edition

GreenSpin is a vertical farming unit technology that integrates natural sunlight and renewable energy sources into an indoor and controlled environment agriculture (CEA), promoting sustainable and energy-efficient farming practices.

Scaling Ambition

By 2024, iPlant and its partners will collaborate to develop and deploy **GreenSpin**, an advanced vertical farming technology, at one pilot site. The goal is to scale out this innovation to reach 10 urban farmers across Jordan by the end of 2024. **GreenSpin** integrates natural sunlight and renewable energy sources into indoor and controlled environment agriculture (CEA), promoting sustainable and energy-efficient farming practices. By leveraging these technologies, the project aims to achieve a 70% reduction in water usage compared to traditional agriculture and a 60% reduction in energy consumption compared to current vertical farming methods. The **GreenSpin** farming unit will further contribute to a 50-70% increase in crop production efficiency in limited spaces, advancing sustainable urban agriculture within challenged communities.

SCALING READINESS GRAPH



SCALING READINESS METRICS

Scaling Readiness Score
1

Scalability Potential Score
48

This innovation is expected to contribute to the following impacts

CGIAR Impact Areas and Collective

1. Poverty Reduction, Livelihoods, and Jobs
2. Climate Adaptation and Mitigation
3. Environmental Health and Biodiversity

SDGs and SDG Targets

- SDG 6** | Clean Water and Sanitation
- SDG 1** | No poverty
- SDG 2** | Zero Hunger
- SDG 9** | Industry, Innovation and Infrastructure
- SDG 11** | Sustainable Cities and Communities

TOP SCALING BOTTLENECKS IDENTIFIED

1. Affordability
2. Awareness
3. User confidence

INNOVATION PACKAGE

- 1 GreenSpin
- 2 Showcase
- 3 Trial period
- 4 Agricultural Credit Corporation finance mechanisms
- 5 Training programs



INNOVATION PACKAGE DETAILS

The Innovation Package and Scaling Readiness (IPSR) workshop is aimed at designing an innovation package capable of achieving the GreenSpin scaling ambition. The report identifies bottlenecks and enabling factors discovered during the workshop that impact the innovation scaling process. The IPSR workshop participants addressed the bottlenecks of **affordability, awareness/ user confidence**, and trust. The IPSR workshop participants proposed the following enablers to complement the GreenSpin core innovation: financial modalities (e.g., Agricultural Credit Cooperation finance mechanisms), training programs addressing various stakeholders (users, experts, NGOs and CBOs), and innovation demonstration (showcasing) and trial periods.

The table below provides an overview of the core innovation and key enablers that were described as needed to achieve the scaling ambition.

Core Innovation / Enabler	Name	Description
1 Core Innovation	GreenSpin	Is a vertical farming unit technology that integrates natural sunlight and renewable energy sources into indoor and controlled environment agriculture (CEA), promoting sustainable and energy-efficient farming practices.
2 Enabler	Agriculture Credit Corporation green financing mechanisms	ACC dedicated loans for food security, rural development, and water resources development and water saving technology. Under these loans many activities can be financed such as: income generating projects (agribusinesses, targeting women and youth in rural areas), digging wells, water harvesting, purchasing and installing pumps, water tanks, bonds, pipes, filters, emitters, irrigation network, etc. Recently, the ACC reduced the interest rate from 5% to 2 % on projects related to food security, water, energy and field crops. The advantageous conditions of ACC loans, such as low interest rates and flexible payment terms, cater to a wide range of farmer's needs. The flexibility in guarantees contributes to increased food security among these farmers, who also again a heightened awareness of the value of water conservation. In addition, farmers realize that by saving water they save money in the long term.
3 Enabler	GreenSpin demonstration and showcasing	Showcasing allows people to see firsthand the benefits of GreenSpin, such as fresh produce, efficient use of space, water and energy savings, making the concept more tangible and appealing. Furthermore, the demonstration impact can extend beyond the initial showcase, inspiring neighboring communities or other refugee camps to adopt GreenSpin system and its practices.
4	GreenSpin Trial period (30 days)	A trial period (1) allows the community to see vertical farming in action, demonstrating that it is a viable and effective method of food production even in resource-constrained settings like refugee camps; (2) can test how well GreenSpin systems work under local environmental conditions, such as climate, water availability, and soil quality, providing valuable data for scaling up; (3) involving community members in trial periods helps build trust (lowers risk of the investment) and interest in GreenSpin; (4) successful trial can address any doubts or skepticisms within the community about the practicality or benefits of the GreenSpin system, making it easier to gain wider acceptance.
5 Enabler	Training Programs for local community users.	To build the capacity of the local community "potential users" on how the GreenSpin works, how to operate and maintain it. This will increase user confidence. Furthermore, by learning techniques to extend growing seasons or operate year-round, even in challenging climates, community members can continuously produce fresh greens and vegetables, reducing dependency on external food aid. Moreover, it can lead to the creation of jobs related to farming, maintenance, and the sale of products, providing refugees with a means of livelihood.

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Core Innovation / Enabler	Name	Description
6 Enabler	Training program for water and experts	Provide knowledge and skills to experts to understand the technology, installing and operating the innovation. Training can include how to integrate GreenSpin with existing water resources in refugee hosting communities, such as rainwater harvesting systems or greywater reuse, ensuring a sustainable water supply. Water experts can pass on their knowledge to local technicians and farmers within refugee communities, ensuring that the skills and expertise remain within the community, facilitating the long-term sustainability of GreenSpin project. Additionally, experts can contribute to the development of guidelines and best practices for water management in GreenSpin, ensuring that these practices are standardized and widely adopted.
7 Enabler	Training Program for local CBOs and NGOs	Trained CBOs and NGOs can lead pilot projects in refugee-hosting communities, demonstrating the feasibility and benefits of GreenSpin. This project can serve as a model for scaling up. Once successful models are established, these organizations can share successful practices and lessons learned with other communities and stakeholders, promoting broader adoption, and can facilitate the replication of these projects across different refugee communities.



CONTRIBUTING CGIAR INITIATIVE AND PARTNERS

CGIAR LEAD INITIATIVE

Fragility, Conflict and Migration (FCM)

TYPE OF PARTNERS

Private sector
UN-Agency

PARTNERS INVOLVED

iPlant
World Food Program – Innovation Accelerator
International Water Management Institute (IWMI)



DETAILED SCALING READINESS GRAPH AND METRICS

Each of the elements of the Innovation Package have been assessed for their innovation readiness and innovation use.

Level	Innovation Readiness	Innovation Use
0	The innovation is at idea stage	The innovation is not used
1	The innovation's basic principles are being researched for their ability to achieve a specific impact	The innovation is used by the organization(s) leading the innovation development
2	The innovation's key concepts are being formulated or designed	The innovation is used by some partners involved in the initial innovation development
3	The innovation's key concepts have been validated for their ability to achieve a specific impact	The innovation is commonly used by partners involved in the initial innovation development
4	The innovation is being tested for its ability to achieve a specific impact under fully controlled conditions	The innovation is used by some organizations connected to partners involved in the initial innovation development

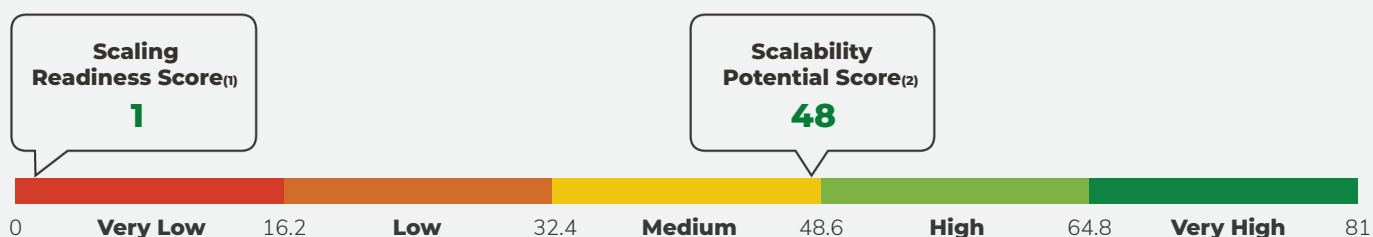
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Level	Innovation Readiness	Innovation Use
5	The innovation is validated for its ability to achieve a specific impact under fully controlled conditions	The innovation is commonly used by organizations connected to partners involved in the initial innovation development
6	The innovation is being tested for its ability to achieve a specific impact under semi-controlled conditions	The innovation is used by organizations not connected to partners involved in the initial innovation development
7	The innovation is validated for its ability to achieve a specific impact under semi-controlled conditions	The innovation is commonly used by organizations not connected to partners involved in the initial innovation development
8	The innovation is being tested for its ability to achieve a specific impact under uncontrolled conditions	The innovation is used by some end-users or beneficiaries who were not involved in the initial innovation development
9	The innovation is validated for its ability to achieve a specific impact under uncontrolled conditions	The innovation is commonly used by end-users or beneficiaries who were not involved in the initial innovation development

More information on Innovation Readiness and Innovation Use can be found at www.scalingreadiness.org.

#	Innovation/Enabler Name	Innovation Readiness	Evidence #	Innovation Use	Evidence #
1	GreenSpin	1		0	
2	GreenSpin demonstration and showcasing	3	https://intapi.sciendo.com/pdf/10.1515/acss-2015-0003	0	
3	Trial period (30 days)	9	Foubert, B., & Gijsbrechts, E. (2016). Try It, You'll Like It—Or Will You? The Perils of Early Free-Trial Promotions for High-Tech Service Adoption. <i>Marketing Science</i> , 35(5), 810–826. http://www.jstor.org/stable/44012190	9	
4	Agriculture Credit Corporation Green Financing Mechanisms	2	Accetturo, Antonio and Barboni, Giorgia and Cascarano, Michele and Garcia-Appendini, Emilia and Tomasi, Marco, Credit Supply and Green Investments (February 12, 2024). Available at SSRN: https://ssrn.com/abstract=4217890 or http://dx.doi.org/10.2139/ssrn.4217890	0	
5	Training Programs for local community users	8		9	
6	Training program for water and experts	8		9	
7	Training Program for local CBOs and NGOs	8		9	

SCALING READINESS METRICS



(1) Scaling Readiness score is based on the lowest scoring innovation

(2) Scalability potential score is based on the average readiness and use of all package elements



SCALING OPPORTUNITIES AND BOTTLENECKS

There are several opportunities for the GreenSpin to be deployed to support water security and nutritional diversity in refugee-host communities in Jordan, particularly reduced land usage, lower water consumption, pesticides free products, ability to grow crops year-round, independent of weather conditions and a stable food supply. However, its uptake is still modest due to bottlenecks such as affordability, awareness and user confidence.

The key bottlenecks identified by the experts are:

1. Affordability
2. Awareness
3. User confidence

According to workshop participants **affordability** can be a significant bottleneck for implementing GreenSpin in refugee-hosting communities due to several factors: (1) high initial investment costs, (2) operational cost, (3) access to finance, (4) market access to sell products, (5) economic priorities. Refugee-hosting communities often face pressing economic challenges, including the provision of basic needs such as food, shelter, and healthcare that might limit their ability to invest in such innovations. Despite these challenges, participants proposed that the existing financing mechanisms deployed by the Agriculture Credit Corporation (ACC) as a way to mitigate affordability issues and promote vertical farming in refugee-hosting communities. Furthermore, international organizations can provide financial support in the form of subsidies, grants, or low-interest loans to offset initial investment and operational costs. Additionally, a community-based model can distribute costs and benefits across a larger group, making it more affordable for individuals.

In addition, **limited awareness** was ranked as a second bottleneck. According to participants, limited awareness can significantly impede the scaling of GreenSpin in refugee-hosting communities due to the following reasons: (1) lack of knowledge about GreenSpin, (2) perceived complexity and risks, can deter individuals and communities from exploring or investing in it, especially in the lack of agricultural experience, (3) misinformation and misconceptions about GreenSpin, such as doubts about crop quality or system sustainability can lead to resistance and reluctance to try a new farming method, (5) limited exposure to successful models and success stories especially in refugee hosting communities, (6) educational barriers, due to limited access to education and training programs on vertical farming this can prevent community members from acquiring the necessary knowledge and skills to implement and sustain these systems, and (7) limited promotional outreach and communication strategies can result in low levels of awareness. Experts proposed some solutions like:

- 1. Training programs** Organizing workshops, seminars, and training sessions to educate refugees and host communities about vertical farming, its benefits, and how to implement it can build awareness and interest.



The third critical bottleneck was **user confidence** for successful adoption and scaling of innovation. When potential users lack confidence in a new technology or product, they are less likely to adopt it, regardless of its potential benefits. This lack of confidence can become a significant bottleneck, preventing innovations from reaching their full market potential. This is due to some factors like: (1) a lack of familiarity, vertical farming is a relatively new and high-tech approach to agriculture. Refugee communities, often coming from rural backgrounds with traditional farming practices, may lack familiarity with and understanding of this technology. This unfamiliarity can lead to skepticism and reluctance to adopt new methods, (2) cultural and social barriers, traditional agricultural practices are often deeply ingrained in cultural and social norms. Introducing a radically different farming method like vertical farming can face resistance due to these deeply rooted practices and beliefs, (3) limited trust in technology providers, refugees and hosting communities may have limited trust in external providers, NGOs, or government agencies promoting vertical farming, (4) sustainability concerns, refugees may be concerned about the sustainability and long-term viability of vertical farming, particularly in terms of water and energy use. Ensuring that vertical farming solutions are resource-efficient and suitable for the local context is essential to build confidence. Experts proposed some solutions like:

1. **Showcase success** demonstrations/pilot: Establishing a pilot GreenSpin (vertical farming) demo site within refugee-hosting communities like Ramtha or Mafraq areas can serve as a tangible example of success. Such projects can provide evidence, showcase the feasibility and benefits of vertical farming, encouraging wider adoption.



ACKNOWLEDGMENT

We would like to thank all Funders who support this innovation through their contributions to the **CGIAR Trust Fund** (<https://www.cgiar.org/funders/>).

The information for this Innovation Package and Scaling Readiness Report was generated during the workshop that took place in Amman, Jordan on 3 July 2024. This Report was prepared by Maha Al-Zu'bi, Miraj Michalscheck, and Sarah Hulbert based on guidance from CGIAR's Portfolio Performance Unit (PPU). The authors thank AquaPoro and all the workshop participants and the CGIAR Innovation Packages and Scaling Readiness (IPSR) team for their valuable contributions.

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For general queries related to the Innovation Package and Scaling Readiness (IPSR) reports and processes, please contact performanceandresults@cgiar.org.



MORE INFORMATION

Reference Material

- CGIAR MELCOP Glossary including key Innovation and scaling concepts and definitions: https://drive.google.com/file/d/1v005wt4z3bgs_wCYa7H2FiFTVSAXAVj/view
- Scaling readiness website: <https://www.scalingreadiness.org>
- Innovation Readiness levels: [IPSR Infographic Innovation Readiness](#)
- Innovation Use levels: [IPSR Infographic Innovation Use](#)
- <https://features.csis.org/surviving-scarcity-water-and-the-future-of-the-middle-east/>



EVIDENCE ANNEX

The below evidence has been validated to support the innovation readiness and innovation use claims.

Evidence #	Evidence URL
I	Showrooms as a Window to Science Based Innovation. https://intapi.sciendo.com/pdf/10.1515/acss-2015-0003
II	Foubert, B., & Gijbrecchts, E. (2016). Try It, You'll Like It—Or Will You? The Perils of Early Free-Trial Promotions for High-Tech Service Adoption. <i>Marketing Science</i> , 35(5), 810–826. http://www.jstor.org/stable/44012190
III	Accetturo, Antonio and Barboni, Giorgia and Cascarano, Michele and Garcia-Appendini, Emilia and Tomasi, Marco, Credit Supply and Green Investments (February 12, 2024). Available at SSRN: https://ssrn.com/abstract=4217890 or http://dx.doi.org/10.2139/ssrn.4217890



EXPERTS ANNEX

The following experts contributed to the Innovation Package and Scaling Readiness workshop and assessment.

Name	Affiliation	Organization	Gender
Luna Al-Hadidi	Director, Water and Soil Directorate	National Agriculture Research Center	♂
Imad Al-Quran	Consultant	FAO	♀
Frank Rijkers	Deputy Director	Advance Consulting	♀
Sawsan Shamasneh	Senior Performance Improvement Manager	IREX- Higher Education for Innovation and Growth (HEIG)	♂
Elham Najem	Innovation Division	JEDCO	♂
Salsabeel Abu Dhrais	Specialist Research	WANA Institute	♂
Qasim Al Hyari	Electric Engineer	Jordan Valley Authority	♀
Amjad Abed	Studies Division	Royal Scientific Society	♀
Sana Al-thawbteh	Engineer	Ministry of Water and Irrigation	♂
Luma Abbadi	Project Officer	UNDP	♂
Talal Joudeh	Head of Water and Environment Division	Ministry of Agriculture	♂
Mohamed Ghaith	Water and Environment Engineer	Jordan Valley Authority	♀
Suzan Hanandeh	Head of Urban Agriculture Division	Greater Amman Municipality	♂
Maha Al-Zu'bi	Regional Researcher	IWMI-MENA	♂
Nafn Amdar	Senior Research Officer	IWMI-MENA	♂
Mirja Michalscheck	Postdoctoral Fellow	IWMI-Ghana	♂
Sarah Hulbert	Consultant	WFP Innovation Accelerator	♂
Mohamed Khataibeh	Farmer / Farm Owner	Private Sector	♀
Osama Al-Zyoud	Farmer / Farm Owner	Private Sector	♀



About Stability-and-Peace Accelerator

The Stability-and-Peace Accelerator is a joint activity by the World Food Programme (WFP) [Innovation Accelerator](#) and the [International Water Management Institute](#) (IWMI), a [CGIAR](#) Research Center. Leveraging the combined expertise and resources of the WFP Innovation Accelerator and CGIAR, this program supports private-sector innovators in scaling climate-smart solutions across food, land, and water systems in fragile and conflict-affected communities in Africa, and the Middle East. It is part of the CGIAR Initiative on [Fragility, Conflict, and Migration](#) (FCM).

The Stability-and-Peace Accelerator selected four innovations that can significantly enhance the resilience of communities in FCAS. The selected innovations align with prioritized themes based on market demand and are expected to create tangible and scalable impacts toward achieving the Sustainable Development Goals SDG 1 (No Poverty), SDG 2 (Zero Hunger by 2023), SDG 5 (Gender Equality), SDG 13 (Climate Action), and SDG 17 (Partnerships for the Goals). The accelerator provides financial, technical, and business support, along with investment readiness coaching and marketing skills.

CGIAR Initiative on Fragility, Conflict, and Migration: The CGIAR Initiative on Fragility, Conflict, and Migration, also known as FCM, addresses challenges to livelihood, food, and climate security faced by some of the most vulnerable populations worldwide. The Initiative focuses on building climate resilience, promoting gender equity, and fostering social inclusion. [Fragility, Conflict, and Migration - CGIAR](#)

Disclaimer: This publication has been prepared as an output of the CGIAR Initiative on Fragility, Conflict and Migration and has not been independently peer reviewed. Responsibility for editing, proofreading, and layout, opinions expressed, and any possible errors lies with the authors and not the institutions involved.

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