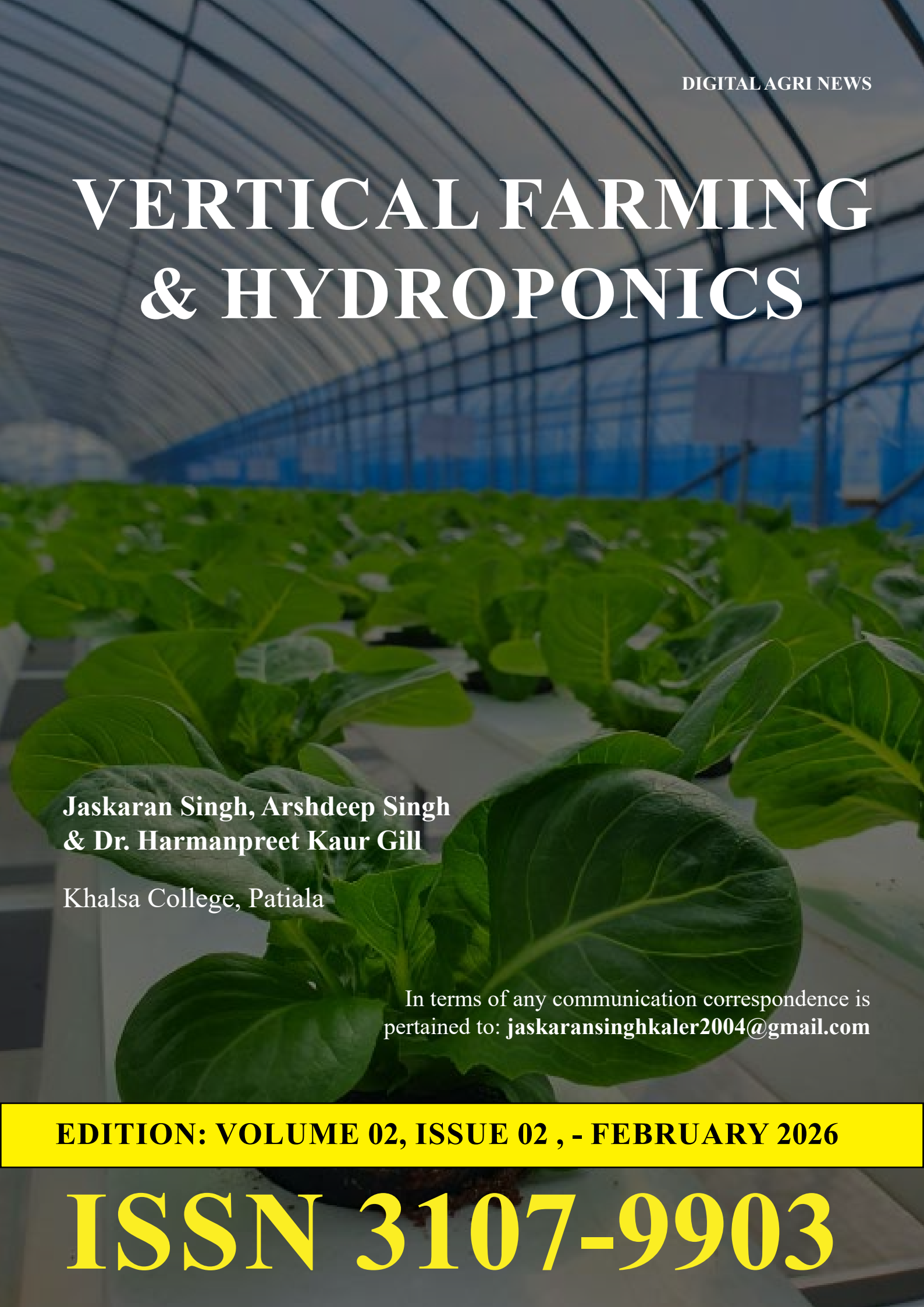
DIGITAL AGRI NEWS

VERTICAL FARMING & HYDROPONICS



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Introduction

Vertical farming and hydroponics are innovative agricultural methods designed to meet the growing demand for food in a sustainable way. With rising population, shrinking farmland, and climate change challenges, traditional farming faces serious limitations. Vertical farming involves growing crops in stacked layers, often indoors, using controlled environments.

What exactly is vertical farming?

A Vertical farming is a modern method of growing crops in vertically stacked layers instead of spreading them across large fields. It is usually practiced indoors in controlled environments using artificial lighting, temperature control, and advanced irrigation systems. The concept was popularized in 1999 by Professor Dickson Despommier of Columbia University, who proposed growing food in tall urban buildings to solve food shortages. However, similar ideas existed earlier in greenhouse farming.

Now,what exactly we know about hydroponics and uses

Hydroponics is a method of growing plants without soil using nutrient-rich water solutions

- Plant roots receive essential minerals directly from water, allowing faster growth and higher yields.
- It uses less water compared to traditional farming because water is recycled within the system
- Hydroponic systems can be set up indoors or outdoors under controlled environmental conditions.
- This technique reduces soil-borne diseases and is widely used in modern vertical farming practices..
- Hydroponics allows precise control over nutrients, pH levels, and water supply, helping plants grow healthier and more uniformly compared to traditional soil-based farming

systems.

- Common hydroponic systems include nutrient film technique (NFT), deep water culture (DWC), and drip irrigation systems
- Hydroponics supports year-round cultivation since environmental factors like temperature and light can be artificially controlled
- It requires significantly less land area, making it suitable for urban farming, rooftops, greenhouses, and indoor agricultural production units
- Crops such as lettuce, spinach, tomatoes, cucumbers, and herbs grow especially well in hydroponic environments.
- Hydroponics supports year-round cultivation since environmental factors like temperature and light can be artificially controlled

Why we need vertical farming and hydroponics

1. Vertical farming and hydroponics help overcome land scarcity by producing more crops in limited space, making them ideal for urban areas where traditional farmland is not easily available.
2. These systems use significantly less water than conventional agriculture, as water is recycled efficiently, helping conserve resources in regions facing water shortage
3. Make.Controlled indoor environments reduce dependency on climate and weather changes, allowing year-round crop production with higher yields

Word Startups focus on vertical and hydroponics

iFarm – Finnish ag-tech company developing software and automated vertical farming systems for salads, strawberries, and other crops..

- **Eden green tech** – U.S. company building hydroponic vertical farming systems for commercial crops and research greenhouses
- **AppHarvest** – American hydroponic and vertical farming producer focused on large greenhouses..
- **Cityblooms** – Urban farming startup in California developing modular hydroponic systems for local distribution

Future Of vertical farming and hydroponics in India

The future of vertical farming and hydroponics in India appears highly promising as the country faces challenges like rapid urbanization, shrinking agricultural land, and water scarcity. With increasing demand for fresh, pesticide-free vegetables in cities, controlled environment farming offers a reliable solution. These systems use less water, require limited space, and allow year-round production regardless of climate conditions. Government support for agri-tech startups and rising interest among young entrepreneurs are further boosting this sector.

How may Indian farmer may adopt this technology

Farmers in India can learn vertical farming and hydroponics through agricultural universities, Krishi Vigyan Kendras (KVKs), government training programs, and online platforms like YouTube and agri-tech courses. They can also visit successful model farms and attend agricultural expos. By adopting these technologies, farmers can achieve higher yields, better quality produce,

Challenges and Sensible Warnings

- Access & equity. Not all farm- ers have smartphones, internet, or trust in algorithmic advice. Solutions must be affordable, lo- cal-language, and human-centred.
- Technical knowledge is essential , as proper nutrient and ph managements
- Skills & support. Tech needs field technicians, training and mainte- nance. Without on-ground support, advanced machines can sit unused.
- Environmental trade-offs. Some in- tensification can harm biodiver- sity if not managed carefully— so the goal must be sustainable intensification (more yield, less harm).
- Regular monitoring and maintenance are required, since system failures like pump breakdowns can harm plants within a short period

How governments play crucial role in this sector to boost growth

- Subsidies and pilot programs that test tech with smallholder groups.
- Open data (weather, soil maps) paired with privacy protections.
- Training hubs and technician net- works so machines keep working.
- Finance models (rentals, machinery-as-a-service, pay-per-use) so farmers don't need heavy capital.

A FUTURE PLAN

In A strong future plan for vertical farming and hydroponics in India should focus on gradual expansion, skill development, and market connection. Farmers should begin with small pilot projects to understand system management and costs before scaling up. Training programs, partnerships with agri-tech companies, and government subsidies can support adoption. Building direct links with supermarkets, hotels, and online grocery platforms will ensure stable demand and better pricing. Investment in renewable energy like solar power can reduce electricity costs. Continuous research, innovation, and collaborations done.

CONCLUSION

Vertical farming and hydroponics offer sustainable, space-efficient, and water-saving solutions for modern agriculture. With proper knowledge, investment, and market planning, they can enhance food security, profitability, and environmental sustainability in the future.

REFERENCES

1. **(FAO) –** Publishes global reports on hydroponics, soilless cultivation, water efficiency, and sustainable agricultural technologies worldwide. https://www.fao.org/food-safety/news/detail/Modern-indoor-farming-opportunities-and-food-safety-challenges-highlighted-in-new-FAO-report/en?utm_source=chatgpt.com
2. **(USDA) –** Provides research, technical guides, and data on controlled environment agriculture and hydroponic crop production systems
3. **(NASA)** – Conducted early hydroponic and controlled-environment research for space food production experiments. https://www.nasa.gov/technology/tech-transfer-spinoffs/nasa-research-launches-a-new-generation-of-indoor-farming/?utm_source=chatgpt.com
4. **Dickson Despommier –** Discusses origin, scientific background, and global future of vertical farming concepts.