Advanced farming: Profits from Innovation

In today's world food insecurity is a growing concern, more so due to the natural calamities and the ever-growing population. Advanced farming practices are crucial in supporting the global demand for food. Recent studies indicate that experts estimate the world population will reach around 9.7 billion by 2050. To meet this growing population's dietary needs, we must produce approximately 70% more food than our current production levels. In fact, the world will need to increase food production significantly to meet these needs. If we use the same techniques and agricultural sciences as we are doing now, we are going to need much more land and natural resources, which are already scarce.

Advanced Farming Pioneers – The Netherlands

There is one country pioneering the food production chain like no other: the Netherlands. The Netherlands is a country with a very small land area of less than 50,000 square kilometres. However, it is the number two food producer in the world. They achieved this by introducing hi-tech greenhouses very early on in the game. They use techniques in their greenhouses that make it possible to get approximately 20 times more produce using four times less water as compared to an open field. Their greenhouses are continuously testing out ways to improve food growth. For example, they use LED lights that act as pest repellents. Also, these lights increase the nutritional value in foods. Furthermore, they use drones to kill moths.

The demands of greater populations and the need to bring better food production to developing countries could be solved by agricultural innovations like these. We need to secure our food production and introduce sustainable production that uses less water, fertiliser, and land. Indeed, hi-tech greenhouses could be the next step.

Advanced farming practices in the Netherlands.
Source: Pixabay.

Advanced Farming for Sustainability

On a technological front, the greenhouses in the Netherlands are utilising the most advanced agricultural science. In fact, this technology allows for reduced resource usage, fewer inputs, and increased productivity. Some of the technologies they use are:

- Combined Heat & Power – CHP
- Greenhouse Automation
- Horizontal Screening Systems
- Soil testing/assessments with AI technology
- Hydroponics/greenhouse farming
- and Insect Netting Systems

These are some of the many technologies used. The structure of a greenhouse can be tailor-made to suit the needs of the location. Furthermore, you can adjust it according to the climate conditions. It's innovations like these that can help prevent land degradation and biodiversity loss caused by traditional agriculture.

Advanced Farming: Regenerative Agriculture

Historically, increasing plant diversity in the same area helps build healthier soil. This is considered part of regenerative agriculture. In fact, regenerative agriculture revitalises ecosystems, soil, and farming practices for a healthier and more sustainable approach. For example, some of the positive aspects of regenerative agriculture are:

- improving soil health
- increasing biodiversity
- controlling erosion
- managing water
- carbon sequestration
- reducing chemical inputs
- crop rotation and polyculture
- and animal integration

Regenerative agriculture as an advanced farming practice.
Source: Freepik.

Advanced Greenhouses for Developing Economies

Hi-tech greenhouses can offer significant benefits for developing nations in several ways. Some of these are:

- **Water Efficiency:** Hi-tech greenhouses often feature advanced irrigation systems that optimise water usage. In a developing nation, often fresh water is an expensive and scarce resource.
- **Higher Crop Yields:** Hi-tech greenhouses provide a controlled environment, allowing crops to thrive all year round. This can lead to increased yields and reduced dependency on seasonal weather patterns.
- Climate Resilience: Developing nations often feel the brunt of climate change harder than others. Growing crops in the safety of a controlled environment brings food security to the nations that need it most.
- **Year-Round Employment:** Hi-tech greenhouses can provide year-round employment opportunities, contributing to economic development and stability.
- **Local Food Production:** Hi-tech greenhouses can support local food production, reducing the reliance on imported goods and promoting food security.

However, in developing nations, hi-tech greenhouses face hurdles such as high costs, high energy needs (depending on the crop), and technical know-how. Limited access to financing, market challenges, and water scarcity also pose problems. Overcoming these obstacles requires tailored solutions, training, supportive policies, and partnerships to promote the widespread use of hi-tech greenhouses while ensuring sustainability and economic growth.

What Are Green Supermarkets?

A green supermarket, also known as an eco-friendly or sustainable supermarket, is a retail store that sells groceries. Furthermore, this kind of store operates with a strong emphasis on environmentally responsible and sustainable practices. These supermarkets aim to minimize their negative impact on the environment while promoting eco-conscious consumer choices.

The Role of Green Supermarkets in Developing Economies

Green supermarkets in developing nations serve a dual purpose: They offer environmentally sustainable and locally sourced products while fostering economic growth and sustainability. These supermarkets provide access to eco-friendly and healthier product choices, support local farmers and producers, and raise awareness about responsible consumption. By prioritising sustainability in their operations, promoting sustainable agriculture, and minimising energy consumption, green supermarkets contribute to sustainable development, local employment, and improved public health in developing nations.

The Good Greenhouse: Advanced Agriculture

Greenhouse farming, also known as horticulture or controlled-environment agriculture, involves growing plants in specially designed structures that regulate environmental factors like temperature and humidity to create optimal conditions for plant growth. This method allows for extended growing seasons, protection from adverse weather, and improved control over pests and diseases, making it suitable for various crops. Furthermore, greenhouse farming is especially useful in regions with extreme climates or limited arable land and promotes efficient and sustainable agriculture. In fact, greenhouses are used to cultivate a wide range of crops, including vegetables, fruits, flowers, and herbs.

Greenhouse farming entails cultivating plants within controlled structures that manage environmental conditions. These structures, constructed from materials like glass or plastic, oversee factors like temperature, humidity, and light to create optimal growth conditions for crops. Inside the greenhouse, systems control the climate, irrigation, and nutrient delivery, ensuring plants receive the precise levels of warmth, water, and nutrients they require. Also, strategies are employed to safeguard against pests and diseases. Furthermore, greenhouses facilitate year-round and high-quality crop cultivation, proving particularly valuable in regions with extreme weather or limited arable land.

Though greenhouse farming is about trapping heat to cultivate plants,

greenhouses can be adapted to warmer conditions. In fact, several strategies can be employed. Greenhouse structures can be better insulated and equipped with natural ventilation systems to prevent excessive heat build-up. Also, energy-efficient cooling and water management practices help maintain ideal conditions. Furthermore, shading systems can reduce the temperature inside. Selecting heat-tolerant crop varieties and using automated climate control based on real-time data are essential. These combined efforts create a controlled environment suitable for crop growth, even in hotter climates.

Green Supermarkets: Profits And Sustainability

Tailor-made infrastructure in hi-tech greenhouses optimizes resource usage, reducing waste and emissions. Agricultural innovation, including the use of higher-yielding seeds, enhances productivity in crops like rice and wheat. To maximise their potential, these seeds require water, fertilisers, and pesticides. In fact, when paired with hi-tech greenhouses, higher-yielding seeds thrive while minimizing resource consumption. Furthermore, minimising resource use and maximising production will give better economic yields.

Green supermarkets should take advantage of these opportunities to become part of the sustainable food supply chain. Furthermore, collaborating with innovative new technologies to produce food, along with revolutionising the way the food is transported, marketed, and sold will enable humanity to keep up with the food demand of the escalating population. Indeed, we will always need nutritious food. In fact, it is a fundamental human right. Humanity must upgrade its food production to match the population's needs.

> *The most effective innovations in greenhouse engineering design, operations and management, will incorporate input from partnerships with the academic, private and public sectors of society. Furthermore, successful applications include, at least to some degree a multi-disciplinary approach of the sciences, engineering and economics, while for ultimate success and sustainability, societal and political support must also be attained.*
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> *Giacomelli et al.*

The THRIVE Framework for Advanced Farming

THRIVE Framework uses the latest technology to measure sustainability. It is a framework that is a transdisciplinary, holistic model that aims to investigate the likely outcome of actions well before they occur. Context-Based Metrics is one of THRIVES 12 Foundational Focus Factors. Furthermore, it is about measuring the sustainability of a company based on the context in which they work. Measuring the resources used and the crop yields of hi-tech greenhouses in conjunction with green supermarkets, THRIVE aims to accurately gauge an entity's true sustainability.

Moving Forward: An Advanced Future for Farming?

In conclusion, in the future, will hi-tech farming and green supermarkets collaborate with each other using innovative technologies to meet rising food demand sustainably and ensure nutritious, accessible, and efficient food production and distribution? The answer is nobody knows. However, it seems a viable and sustainable solution to satisfying the nutritional needs of a growing population. THRIVE's purpose is to research, educate, and advocate on sustainability and thrivability making information accessible and digestible to people across the globe. We want to live beyond sustainability, past breaking even, to thriving and flourishing.

Why is it essential that we focus on Advanced farming and Green Supermarkets for developing economies?

It is imperative that we prioritise hi-tech farming and green supermarkets for developing economies because these initiatives offer multifaceted solutions to pressing global challenges. In fact, hi-tech greenhouses and green supermarkets form a symbiotic relationship, where hi-tech greenhouses supply fresh, locally grown produce to green supermarkets. Furthermore, this collaboration ensures a

steady, year-round supply of high-quality, sustainable fruits and vegetables, reducing the need for long-distance transportation and promoting food security. Indeed, both contribute to local economic development by creating jobs in agriculture and retail. Together, they establish an efficient and environmentally conscious food production and distribution system, benefiting local communities, economies, and the environment. By investing in these approaches, we can foster economic growth, and protect the environment forging a more resilient and sustainable future for developing nations and the world.

achieving the United Nations Sustainable Development Goals (SDGs) and how they link to Advanced farming and Green Supermarkets

The Sustainable Development Goals (SDGs) are a universal call to action, addressing global challenges such as poverty, inequality, climate change, and sustainable development, with the aim of ensuring a better future for all. Hi-tech farming and green supermarkets address several of these.

Hi-tech farming and green supermarkets both address SDG 2 which is: "End hunger, achieve food security and improved nutrition and promote sustainable agriculture". Using innovative technologies in hi-tech farming aims to meet nutritional needs along with minimising resource use and carbon emissions. Also, green supermarkets don't just sell sustainable food, they implement sustainable strategies to mitigate their climate impact. Furthermore, SDG 3, focuses on: "Ensure healthy lives and promote well-being for all at all ages". Nutritious food is a crucial component of healthy living. SDGs 9 & 11 focus on sustainable cities and infrastructure with an emphasis on innovation. Reducing inequality is the keynote of SDG 10. When everybody is eating what is necessary for them, this reduces the inequalities of health brought on by malnutrition.

A Thrivable Framework

Safeguarding human well-being in all domains is paramount to THRIVE's mission. This means ensuring that all humans have enough nutritious food to eat, globally.

People can't thrive or even survive without adequate nutrition. In fact, it isn't enough for people to have full bellies. It is vital that people receive the vitamins and minerals necessary for their body to continue functioning and repair itself when injured or sick. Thrivability is about getting the nutrition necessary.

Humanity can do better with the information and technology available. In fact, the Netherlands has proved this beyond reasonable doubt by maximising the use of its minimal land to feed a population of over 17 million people (2023 figures). Hi-tech greenhouses, along with green supermarkets such as Ekoplaza, feed the people of the Netherlands with the nutrition they need. This is a sustainable solution that keeps the complications associated with hunger and malnutrition at bay.

THRIVE's logo, a ciambella chart, outlines two important boundaries for humanity to adhere to. These boundaries are – a social floor, denoting the minimum for an entity's survival; and an environmental ceiling, where too many resources are taken from the environment. Hi-tech farming and green supermarkets aim to ensure people receive the nutrition they need. Furthermore, by streamlining production and minimising resources, hi-tech farming guarantees to keep from breaking through the environmental ceiling.

If you want to learn more about THRIVE and walk with us on our journey to thrivability, please peruse our blogs, hit 'subscribe' on our YouTube channel, check out our podcasts, register for our regular webinars, or sign up for our informative newsletters. We would love to have you thrive with us.