

# IMEC Film Farming: A Game Changer for Modern Farming

J. Suresh Kumar, Saravanan Raju, H. Kesava Kumar, T. Krishnakumar

ICAR-Central Tuber Crops Research Institute, Thiruvananthapuram, Kerala, India

suresh.j@icar.gov.in

Agriculture has come a long way with modern farming techniques that are crucial for many reasons. The most significant benefit is that these techniques help farmers produce more food to feed the growing population. Precision farming, genetically modified crops, and advanced irrigation systems are some of the modern techniques that enable farmers to get more out of their crops, increasing efficiency and reducing costs. These techniques are also important for sustainability. Sustainable agriculture practices like conservation tillage, crop rotation, and cover crops help reduce soil erosion and minimize pollution in our soil and water, making sure that agriculture is sustainable and can continue to meet our needs for years to come.

One of the popular methods of growing vegetables and horticultural crops is greenhouse cultivation. It provides a controlled environment that protects crops from harsh weather conditions and pests, improving productivity and quality by reducing stress on plants. By maximizing input use like water, fertilizers, and light, farmers can achieve higher yields compared to traditional open-field cultivation. This method helps plants grow faster,

produce more flowers and fruit, and have a longer growing season.

Film farming is a unique method of crop production where a thin film of waterflows over a membrane holding plant roots. Recently, a new technology called IMEC (Intelligent Membrane Culture) has been developed to improve film farming. IMEC is an intelligent system that can monitor and control the growth conditions of crops by adjusting the flow of water and nutrients to meet plant needs. This results in higher crop yields and better-quality produce.

One of the benefits of IMEC is its ability to conserve resources such as water and nutrients. The system is designed to give crops only what they need, which reduces waste and is better for the environment. Additionally, it can be automated, saving labour costs and making it more convenient for farmers. This method is also ideal for urban agriculture, where space is limited. By using this technology, farmers can grow crops in small spaces and reduce the need for long-distance transportation. It is a revolutionary technology that offers a more efficient, environmentally-friendly, and convenient method of crop production. It is an innovative way to meet the growing demand for food while using fewer resources.

The smart system can monitor and control the growing conditions for plants, adjust the flow rate and composition of nutrient solution, and reduce water and nutrient use, while increasing crop yields and improving crop quality. It can be automated and is suitable for urban farming, reducing the need for transportation and distribution of crops. However, IMEC film farming requires proper installation, maintenance, and a reliable source of resources. In addition to the benefits mentioned, IMEC film farming has the potential to revolutionize the way we approach agriculture. By using this technology,

farmers can grow crops in areas where traditional farming methods are not feasible, such as in deserts or regions with poor soil quality. This opens up new possibilities for sustainable food production and can help to combat food insecurity in regions that struggle with access to fresh produce.

Moreover, IMEC film farming is also a promising solution for reducing the carbon footprint of agriculture. By optimizing the use of resources, such as water and nutrients, farmers can reduce the greenhouse gas emissions associated with farming. Additionally, by growing crops locally and reducing the need for transportation, the carbon emissions associated with food distribution can also be minimized. Furthermore, the technology behind IMEC film farming is constantly evolving and improving. As research and development continue, we can expect to see even more efficient and effective systems for growing crops. This could include advancements in the use of renewable energy sources, such as solar power, to further reduce the environmental impact of agriculture. To use IMEC film farming, you will need to set up a membrane system to support the plant roots and allow nutrient solution to flow over them. You will also need to install a smart control system that can monitor and adjust the growing conditions for the plants in real-time.

## Here are the basic steps

**Choose a suitable location:** You'll need a location that can accommodate the membrane system and smart control system. Indoors are preferable, it should have access to a reliable source of electricity and water.

**Install the membrane system:** Set up the membrane system to support the plant roots and allow nutrient solution to flow over them. The membrane can be made from a variety of materials, such as PVC or polyethylene.



**Leafy green production on IMEC membrane and its developer Dr. Yuichi Mori from Japan also seen in picture)**

**Prepare the nutrient solution:** Mix the necessary minerals and elements for plant growth into the nutrient solution. The nutrient solution should be circulated continuously to provide the plants with a constant supply of nutrients.

**Install the smart control system:** Set up the smart control system to monitor and adjust the growing conditions for the plants in real time. The system can be automated, allowing you to control it remotely.

**Choose the crops to grow:** IMEC film farming can be used to grow a variety of crops, including leafy greens, herbs, and vegetables like tomato, and fruit-bearing small crops like strawberries. Choose crops that are well-suited for hydroponic farming and can grow well in a membrane system.

**The following is the step-by-step guide**

1. Choose a suitable location with access to electricity and water
2. Install the membrane system to support plant roots and allow nutrient solution to flow over them
3. Mix the necessary minerals and elements for plant growth into the nutrient solution

4. Set up the smart control system to monitor and adjust the growing conditions for the plants in real time
5. Choose the crops to grow, taking into account the suitability for hydroponic farming and membrane system
6. Start the nutrient solution flow and adjust the smart control system settings as needed
7. Monitor the plants' growth and health regularly
8. Harvest the crops as they reach maturity
9. Clean and maintain the system regularly to ensure optimal growing conditions
10. Repeat the process for each growing cycle

**Overall benefits of IMEC film farming**

**Increased crop yields:** The smart control system can optimize growing conditions for plants, leading to higher crop yields.

**Reduced resource use:** IMEC film farming can reduce water and nutrient use by providing plants with only the necessary number of resources.

**Improved crop quality:** By providing the plants with the ideal growing conditions, crop quality can be improved.

**Reduced labour costs:** The system can be automated, reducing the need for manual labour.

**Reduced pest, disease and nematode damage:** Diseases caused by soil-borne pathogens and nematodes can largely be eliminated due to the soilless cultivation of crops.

**Sustainable farming:** IMEC film farming is a closed-loop system that reduces the risk of nutrient runoff into the environment and can be used in urban environments, reducing the need for transportation and distribution of crops.

**Here are some examples of crops that have been successfully grown using IMEC film farming**

**Lettuce:** IMEC film farming has been used to grow different varieties of lettuce such as romaine, butterhead, and green leaf lettuce. Yield can vary depending on the variety and growing conditions, but studies have shown that lettuce yield can be increased by up to 40% using IMEC film farming. The quality of lettuce grown using IMEC film farming is also high, with crisp leaves and uniform size and shape.

**Basil:** Basil is a popular herb that can be grown using IMEC film farming. Studies have shown that basil yield can be increased by up to 50% using IMEC film farming, compared to traditional soil-based farming. The quality of basil grown using IMEC film farming is also high, with a strong aroma and intense flavour and free of any pathogens for raw consumption.

**Strawberry:** Small fruits like strawberries can also be grown using IMEC film farming. Studies have shown that strawberry yield can be increased by up to 30% using IMEC film farming. The quality of strawberries grown using IMEC film farming is also high, with consistent size, colour, and sweetness.

**Tomato:** Tomato is a very common crop in hydroponic cultivation. This crop has an excellent response to IMEC film farming. The quality of the fruit is very excellent with higher TSS, and juicy and firm tissue.