

# Imec

New House Soil Culture



**Imec is a new innovative production technology of safe, high-quality agricultural crops under minimized water and soil consumption.**



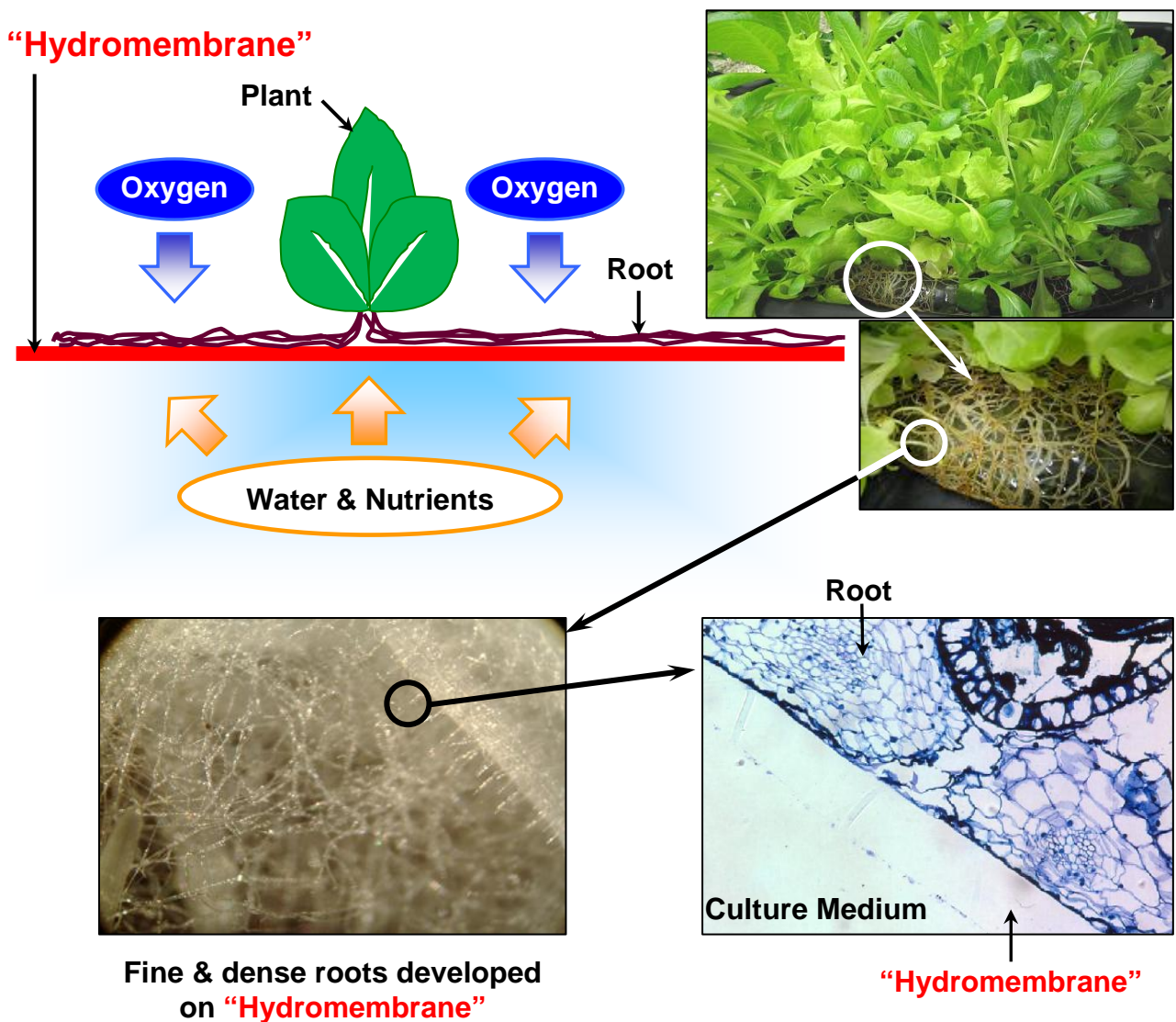
**Mebiol Inc.**

## Basic Principle of Imec

Imec is a plant culture technology by separating the plant from culture medium with a membrane composed of hydrogel, “Hydromembrane”.

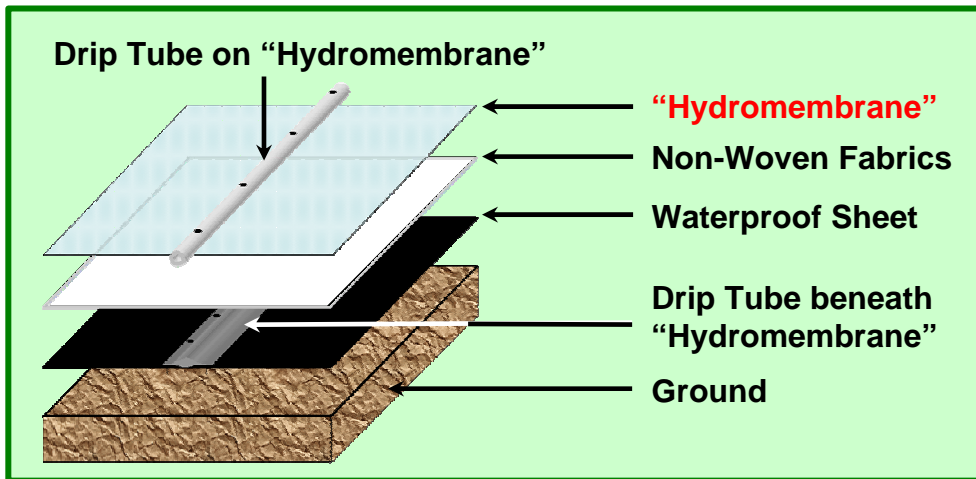
Since “Hydromembrane” absorbs water and nutrients from the culture medium, but releases none of water and nutrients to the air side, the plant side surface is totally dry. Accordingly, the plant develops a lot of fine and dense roots closely attached on “Hydromembrane” so that the plant can take water and nutrients directly from the membrane as much as possible. Additionally, the plant upregulates the production of sugar, amino acids, etc. in order to induce the osmotic shift of water and nutrients from “Hydromembrane”. This means the quality of Imec products becomes very high.

Another important point of Imec is that the incidence of crop damage infected with pathogenic microbes propagated in culture medium is fully controlled even without chemicals, because none of microbes and viruses can penetrate “Hydromembrane”.



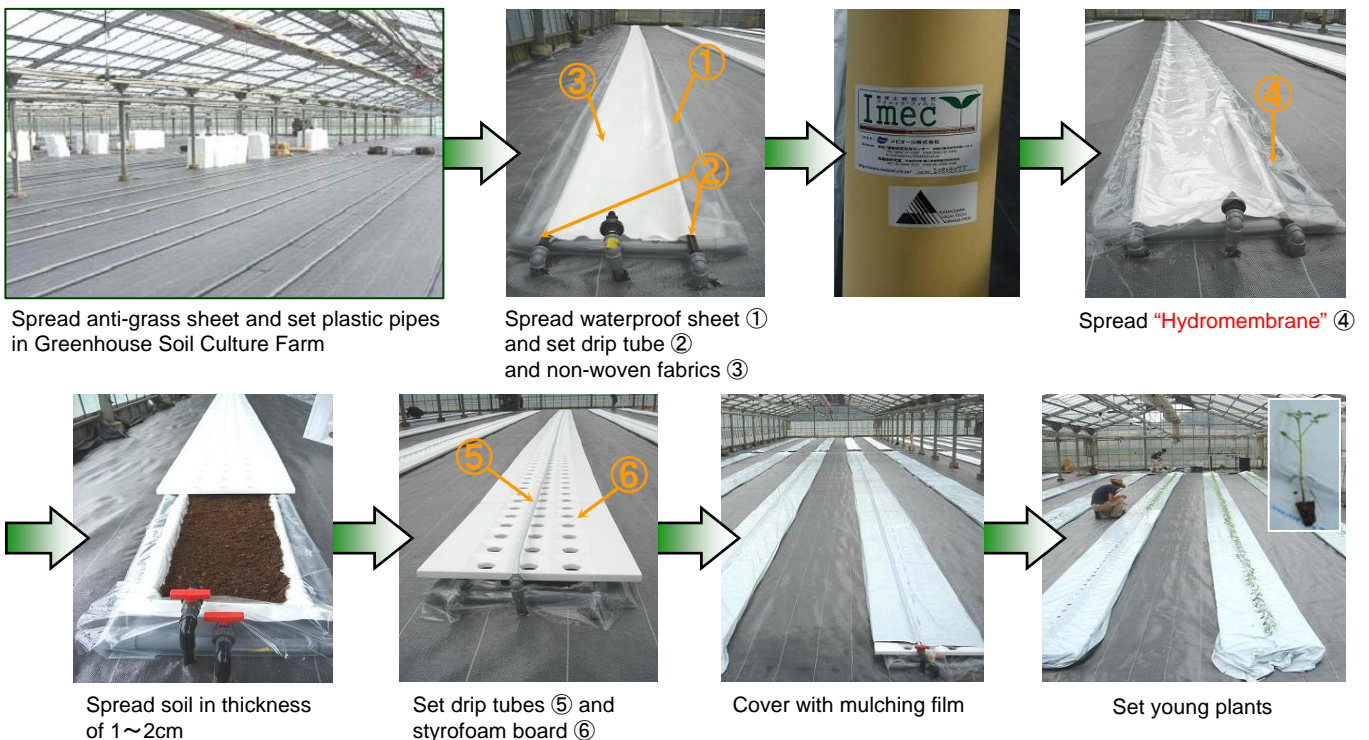
## Pattern Diagram of Imec System

Imec system is composed of waterproof sheet spread on the earth, drip tube beneath "Hydromembrane" supplying culture medium on the waterproof sheet, non-woven fabrics absorbing uniformly the culture medium, "Hydromembrane" closely attached on the fabrics and drip tube supplying culture medium onto "Hydromembrane". Usually, very small amount of soil is spread on "Hydromembrane" and young plants are planted on the soil.



## Actual Setting of Imec System

Imec system can be set by yourself without the heavy machines like tractors and cultivators.



# Actual Imec Production

Young tomato plants of 4,000 pieces grow on “Hydromembrane” in the green house of 1,000 m<sup>2</sup> in area for about 6 months and tomato of about 5 tons is harvested. Annually about 10 tons are harvested. The sugar content of Imec tomato is very high (ranging 8% in summer to 12% in winter) as compared to the usual tomato of about 4%. In Japan, the wholesale price of Imec tomato ranges about \$8 /kg in summer to \$12 /kg in winter and the price of the usual tomato is about \$2 to \$3 /kg. The total sale of Imec tomato generates about \$100,000/year/1,000m<sup>2</sup>.

The crops produced by Imec other than tomato are paprika, cucumber, eggplant, strawberry, melon, vegetables such as spinach, lettuce, rocket salad, herbs, etc.



Young Mini-Tomato



Mini-Tomato



High-Sugar Tomato



Fine & Dense Tomato Roots

A lot of fine & dense tomato roots deposited on “Hydromembrane”

Non-woven fabrics absorbed culture medium



Paprika



Melon



Strawberry



Lettuce

## Issues of Current House Soil Culture

In the current house soil culture, the following serious problems haven't been settled.

### 1) Injury by Continuous Cropping

Since a strong nematicidal methyl bromide was recently restricted, severe contamination of soil by nematode and pathogenic microbes causes a drop in crop production. The alternative methods to methyl bromide are not effective and expensive.

### 2) Soil Contamination by Chemicals and Fertilizers

The chemicals and fertilizers accumulated in soil for a long period, not only contaminate soil, groundwater and crop, but also deteriorate crop productivity due to high salt content in soil.

### 3) Difficulty in High-Quality Crop Production

The most important technology in production of high-quality crops is to water a root keeping a good balance between water and air contents in soil, but it is very difficult to water the roots spread deeply in the soil keeping the good balance. Specially, a lot of long experience is needed to produce the high-quality crops such as high-sugar tomato.

## Advantages of Imec over House Soil Culture

### 1) Perfect Protection against Injury by Continuous Cropping

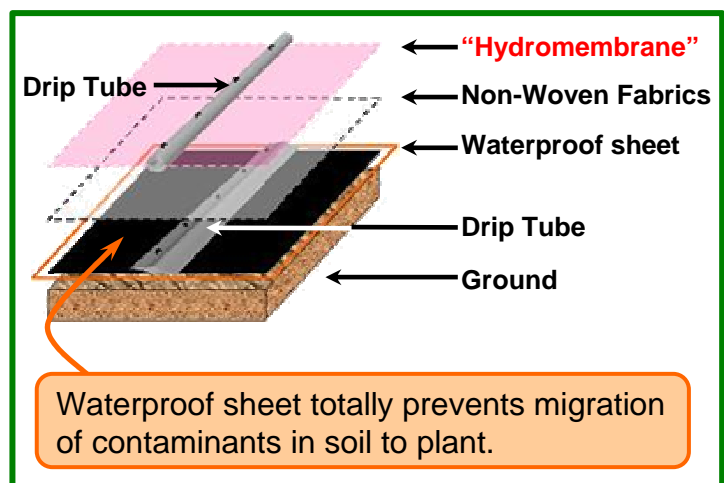
The waterproof sheet separating plants from the ground perfectly protects against injury by continuous cropping, contamination with residual pesticides and growth damage due to accumulated salts.

### 2) Minimizing Culture Medium and Soil

Since the waterproof sheet totally prevents runoff of supplied culture medium to external world, the used culture medium is minimized.

In hydroponics, huge amount of culture medium is discarded, and in the current soil culture a lot of amount of culture medium is lost into soil.

Additionally, in current soil culture, plant roots sterically grow in soil and so bulky soil and culture medium are needed. In Imec, however, thin and flat sheet of roots grows on "Hydromembrane" and so small amount of soil or culture medium is enough. These advantages lead to minimized environmental load and cost.



## Consumption of Fertilizer (kg)at Tomato Production (1,000m<sup>2</sup>).

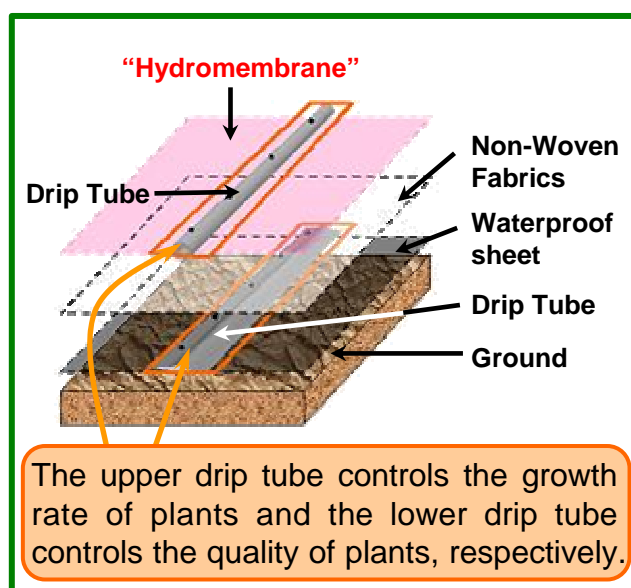
	<b>Imec</b>	<b>Soil Culture</b>
<b>Nitrogen</b>	<b>3.6</b>	<b>28</b>
<b>Phosphorus</b>	<b>1.4</b>	<b>20</b>
<b>Potassium</b>	<b>7.6</b>	<b>26</b>

Because of no waste of fertilizer in Imec, the fertilizer consumption is reduced to about one fifth of soil culture.

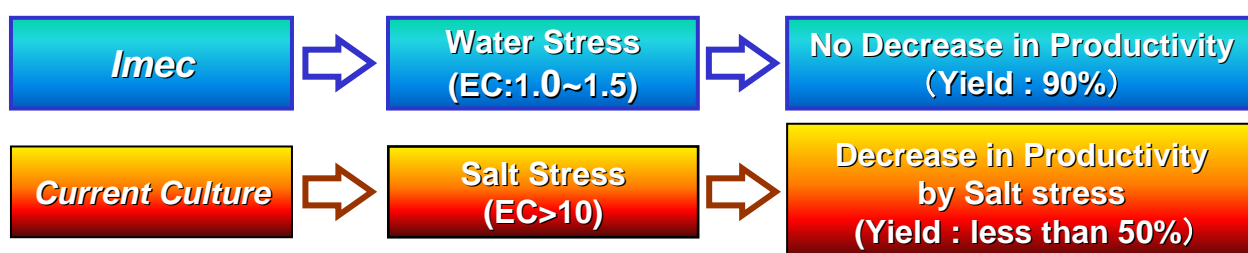
### 3)Perfect Balance between Productivity & Quality

#### Difference in Nutritional Upgrading between Imec and Current Culture

In current culture methods such as soil culture and hydroponics, the nutritional value of crops is considered to be increased only by salt stress which significantly reduces the productivity of crops. Namely, the productivity-quality trade off problem has not been settled by conventional agro-technology. On the other hand, in Imec, pure water stress causing by supplying the culture medium through “Hydromembrane” can enhance the level of nutritional elements such as sugar, amino acids, etc. and the productivity is controlled by supplying the culture medium on “Hydromembrane”.

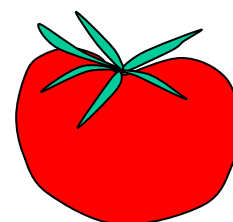


In Imec, the productivity-quality trade off problem is solved.



#### Nutrients in Tomatoes produced by Imec, Hydroponics and soil culture

<b>Nutrients</b>	<b>Imec</b>	<b>Hydroponics</b>	<b>Soil Culture</b>
<b>Sugar</b> (g/100g)	<b>7.6 — 12.0</b>	<b>4.0</b>	<b>4.0</b>
<b>Glutamic acid</b> (mg/100g)	<b>408 — 478</b>	<b>157</b>	<b>172</b>
<b>GABA</b> (mg/100g)	<b>124 — 157</b>	<b>28</b>	<b>28</b>
<b>Lycopene</b> (mg/100g)	<b>10.8 — 13.0</b>	<b>3.0</b>	<b>4.3</b>



GABA (  $\gamma$  - amino lactic acid ) :  
Tranquilizing Action,  
Hypotensive Action.

#### 4) Inexpensive Cost and Big Profit

Since the parts making up Imec system is almost similar to the current house soil culture system except “Hydromembrane”, the system cost of Imec is close to the house soil culture and inexpensive as compared to hydroponics. The Imec profit rockets to about \$ 26,000/year/1,000m<sup>2</sup>. This is because the annual sale of Imec tomato is about \$ 67,200 which is much bigger than the sale of about \$13,400 of the usual tomato produced by the current house soil culture, and the Imec costs of water, seedling, soil, fertilizer, chemicals and labor are much cheaper than the current house soil culture.

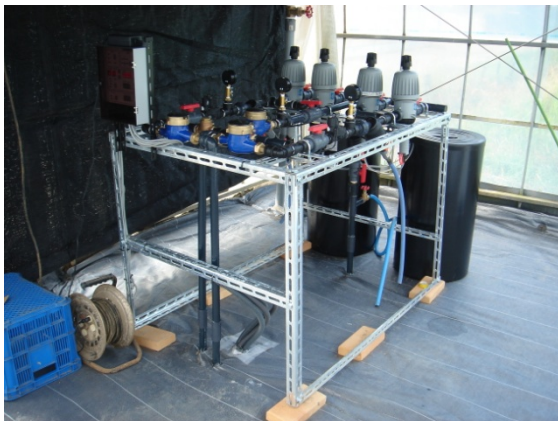


System Cost (unit:\$100) at Tomato Production (1,000m<sup>2</sup>)

	<b>Imec</b>	<b>Hydroponics</b>
<b>System Cost</b>	<b>450</b>	<b>1,000 - 2,000</b>

※ ¥100=\$1

### Imec System



Imec Water Supplying Unit

Imec water supplying unit supplies diluted liquid fertilizer composed of two different compositions of concentrated fertilizers. The dilution and mixing of the fertilizers are performed automatically at previously fixed ratio. Imec water supplying unit can supply the liquid fertilizer at different concentrations to upper drip tube lines and to lower drip tube lines respectively.



Imec Controller

Imec controller automatically controls amount of water supplied from the water supplying unit to 4 sets of upper drip tube lines and 4 sets of lower drip tube lines independently.

## Business Situation of Imec

Not only in Japan but also all over the world, the open- field farming becomes difficult due to the shortage of rain-dependent water for farming caused by global warming. The role of a house soil culture becomes more and more important, particularly, in the case of production of high-quality crops keeping high productivity. However, the above mentioned serious problems of the current house soil culture have not been solved. We found that a newly developed Imec has successfully settled the problems.

In Japan, the total land area of house soil culture comes to 50,000 ha (about 30 times larger than hydroponics) and continues to increase, despite hydroponics business is significantly shrinking. Currently, replacement of house soil culture by Imec is rapidly spreading, from tomato to other crops like strawberry, paprika, cucumber, egg plant, melon, watermelon, lettuce, spinach, rocket, etc. Over 15 organizations including construction company, oil company, food company, trading company, farming private corporations, Japan Agricultural Cooperative (JA), etc. started Imec.

In other countries, we have succeeded in Imec Tomato production in Dubai, because Imec is the most suitable farming method for desert areas where run out of water and soil but are full of sunlight which is the most powerful nutrient for crops.

## Patent Situation

The basic patent on Imec (International Publication No. WO2008/035580) has been registered in Japan and been applied for 126 countries in all over the world.

## Profile of Mebiol Inc.

<b>Establishment</b>	September 18,1995
<b>President, CEO</b>	Yūichi Mori (Visiting Prof. of Waseda Univ.)
<b>Directors</b>	Hiroshi Yoshioka, Akiko Shinkawa
<b>Capital</b>	\$5.8million
<b>Head office / R&amp;D Center</b>	1-25-8 Nakahara, Hiratsuka-shi, Kanagawa 254-0075, Japan Phone : +81-463-37-4301 Fax : +81-463-37-4302
<b>Waseda Univ. Lab.</b>	Advanced Research Institute for Science and Engineering, Waseda University 55-S-401B, 3-4-1 Okubo, Shinjuku-ku, Tokyo 169-8555, Japan Phone : +81-3-5286-3121 Fax : +81-3-3209-0336
<b>Imec Farms</b>	1) Yaese-cho, Shimajiri-gun, Okinawa, Japan 2) Midori-ku, Yokohama-shi, Kanagawa, Japan
<b>Core Technology</b>	We specialize R&D and marketing activities. Our R&D activity focuses on edge polymer technologies such as hydrogels and functional membranes. Our marketing activity develops a new, original and promising market in agro-bio, environmental and medical-bio fields using our original achievements.
<b>Core Business</b>	We are running production & sales of Imec system as our major business in agro-bio area, and the others are production and sales of Sky Gel, the most effective moisturizing agent for roof & slope planting in greening business, and Mebiol Gel business which will be very promising in regenerative medical area.
<b>Remark</b>	Intellectual property right is most important in our company. Over 100 patents were filed in Japan and foreign countries.
<b>Contact Us</b>	E-mail : <a href="mailto:contact@mebiol.co.jp">contact@mebiol.co.jp</a> URL : <a href="http://www.mebiol.co.jp/">http://www.mebiol.co.jp/</a>