

Mini series

Greenhouses in the Middle East <Part 2>

Following the last part of this mini-series, this time, we would like to continue to investigate differences that exist between greenhouses in the Middle East and Japan. Greenhouses in Japan have a lot of varieties in terms of their shapes and covering materials. On the other hand, most greenhouses in the Middle East are arch greenhouse or quonset greenhouse and they are covered by yellow polyethylene sheets.

Pad and Fan

Most greenhouses in the Middle East, especially those in UAE, have a cooling device called the Pad and Fan. The Pad and Fan is a cooling method utilizing the vaporization heat of water, and it contains a pad mainly made of cellulose and a large fan. When we moisten the pad with water, the water in the pad absorbs heat from the surrounding air due to the cooling effect of evaporation. By exhausting indoor air by use of the fan, the system can take in the heat-deprived air to the inside of the greenhouse and cool down the indoor temperature. This method has a better cooling effect when the temperature is higher and the air is drier. The system seems to be more effective in the dry Middle East than in the hot-and-humid summer in Japan, and as a matter of fact, when we visited a greenhouse in UAE in midsummer, the indoor temperature was kept around 30°C and the environment was very comfortable while the outdoor temperature was over 50°C.

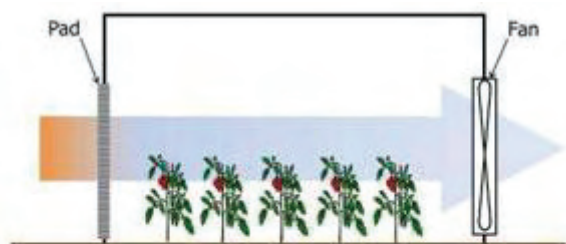


Image of the Pad and Fan



Pad side



Fan side

Differences in greenhouse shapes

Differences in greenhouse shapes between Japan and the Middle East can be understood as follows. Greenhouses in Japan are designed to grow crops mainly in the winter and the focus is on how to



Three-quarter greenhouse

gather more light during the winter when the day length is short and the sunlight is weak. For example, three-quarter greenhouse used for melon cultivation in Shizuoka Prefecture have large roofs facing the south in order to increase light transmission in the autumn and winter.

As for greenhouses in the Middle East on the other hand, it seems that they put emphasis on increasing effectiveness of air cooling by securing a good flow of air. As the indoor air is pulled out by the fan, we can assume that windows on the side wall and a sky window on the roof are not attached and that the house is designed in the shape of an arch in order to reduce occurrence of turbulent air flows.



Greenhouse without windows on the side wall and on the roof

Covering materials

With regard to covering materials, light transmission and heat-retention capacity are strong selling points of greenhouses in Japan, and they are made of transparent glasses or films in general. In contrast, greenhouses in the Middle East are mostly made of yellow polyethylene sheets. When local farmers and technicians are asked why they used yellow sheets, they could not reply to the question clearly as the yellow sheets seem to be standardized. They probably use yellow sheets in order to avoid too strong sunshine during the summer by reducing light transmission and enhancing light dispersion. Through this, it is expected that room temperature increases and a leaf burn caused by direct sunlight, can be prevented.

Through the discussions so far, it seems that we have found a logical reason that both quonset greenhouse and yellow covering sheets in UAE are for increasing a cooling effect. However, the Pad and Fan is not so common for greenhouses in Syria and Iraq, and neither a heating device nor a cooling device is arranged in many cases. Moreover, the climate in these areas has hot summers and cold winters. This differs from the environment in the Gulf oil-producing countries, such as UAE. The climate seems to be more similar to that in Japan than that in UAE. In particular, the winter in the Kurdish region in the north of Iraq, which is famous for horticulture, has the same cold temperature as the one in Tokyo during the winter (the average temperatures in January are 6.1°C in Tokyo and 6.2°C in Erbil, the capital of the Kurdistan Regional Government). The conditions in this region might be different from those prevailing in oil-producing countries in the Middle East. Next time, we would like to investigate greenhouses in the Middle East in non oil-producing countries by analysing a case in the Kurdish region located in the north of Iraq.