Improvement of vegetable cultivation course:
AAI's effort to link abroad experience and training in Japan <Part 3>

Crop production and irrigation technologies

Water is essential for plant growth. Plants absorb much of the nutrition necessary for growth through their roots together with water. Irrigation which provides water to crops artificially is an important technology for cultivation. What is necessary in irrigation is to judge the timing and amount of watering - i.e. when and how much water to provide. In this lecture, we dealt with a wide range of issues from soil to climate related to water movements for plant growth. After the lecture and practice, the participants should have enhanced understanding on the basics of water amount (crop water requirements) and timing (readily available moisture).

The lecture and practice was for one day. Morning was in the classroom and there was a practice in the afternoon. It started with explanation of soils. Soil consists of clay, silt and sand. Depending on the percentage of each component, soil type and its ability to retain water are determined. These are important determinants for irrigation timing. Although participants have the knowledge of the classification of soils such as sand, silt and loam, they seldom understand what kind of soil is sand or other categories. Therefore, in this lecture, we prepared samples of different types of soil so that participants can touch and feel the differences. In addition, using soil from the fields in the JICA Tsukuba, we introduced simple soil classification methods with mixing of soil and water so that they can use the method in their own country.

After the lecture on soil, we had a lecture on climate. Necessary water amount for crops is heavily influenced by climatic conditions such as temperature, humidity, wind speed and intensity of solar radiation. Participants know these things from their own experience. However, in the lecture, we explained in detail about functions of stomas on leaves and the correlation between solar radiation intensity and amount of water absorption. Through the lecture, we tried to link what they knew with actual experience.

This course was participated in from all over the world including South and South-East Asia, Oceania, Central America, the Middle East and North Africa. Every year before the lectures, we check monthly average temperatures of participants' countries and make graphs so that they can see them and compare during the lectures. After finishing a range of talks about climate, we compare climates of different countries. This makes the session very lively each time as each participant starts passionately talking about their own country's climate and related issues. It is a good opportunity for them to learn about situations in other countries. For participants from Oceania with high precipitation and steady average temperature throughout the year, and for participants from arid Middle East or North Africa, exchanging their stories is just like learning about unknown worlds. The training session provides precious opportunities for people who grow up in very different environments to learn together.

After the discussion on climate, we started talking about irrigation water amount. We introduced the FAO recommended Penman-Monteith method. This method uses climate data and enables easy estimation of water demands. Participants are asked to calculate estimated water needs for different crops using calculators. This is the climax of the lecture and it is also the part which is most difficult for us to explain. Every year, we witness participants who understand the method first explaining to those who do not understand yet. This is a good team work and We wait patiently until everybody can do their own calculation. After that, we finish the lecture by establishing an irrigation schedule, based on crop water requirements and readily available moisture determined by soil characteristics.

In the afternoon, we all go to the paddy fields at the JICA Tsukuba to conduct a practice to measure discharge amount in the irrigation channel. This is done by floating a leaf on the water surface and measuring flow speed with a stop watch, and estimating the discharge amount by multiplying with the channel's cross-section area size. It is a fun exercise in which participants cooperate and repeat the exercise, dividing their roles such as a person who lets a leaf go at the upstream, a person measuring the speed with a stop watch and a person who confirms the timing of the leaf reaching the goal. After the practice, they go back to the classroom and work on the calculation to determine the discharge amount of the channel, and apply the figures to devise the potential area size for irrigation with this channel. Although there is a significant gap in speed of understanding among the participants, by the end of the session, everybody becomes able to conduct the calculations on their own. It is only one day a year, but I enjoy the lecture session working with the participants.

Measuring the water flow speed

Calculating the discharge amount