

Agriculture and irrigation in arid lands: From a viewpoint of sustainability (6)

Part 6: Problems Arid Regions Face and Means of Making Full Use of Arid Conditions

In this series, we have presented various examples of traditional farming methods in arid areas, with special reference to "sustainability". What has been noticed during our visits to arid areas is that sometime measures taken to increase productivity result in the opposite effect. For example in many oil producing nations, drip irrigation systems are introduced to increase the efficiency of limited water use and to grow plants using a water saving method. However, because the irrigation water contains salt, salt accumulates on the ground surface and underground water tables at irrigation wells sink and their water quality deteriorates. As a result, some cultivated fields are abandoned. In some coastal agricultural areas, sea water has intruded ground water zones due to over pumping of underground water, which has then resulted in a dramatic rise in salt concentrations in some well water. In areas where irrigation agriculture is conducted from an ample river water supply, as is the case in Syria and Pakistan, salt accumulation and water logging have become major issues. These are typical examples of negative effects brought about by modern agricultural methods in arid regions. Of course, so-called "traditional farming methods" have their own problems, which are often the reasons for the introduction of "modern" methods. However, isn't it necessary to evaluate development plans and their economic effects not only bearing short-term productivity in mind, but also taking sustainability into full consideration ?

Regarding the future direction of arid agriculture, intensive farming is sought in order to effectively utilize limited water resources and limited high-quality arable land in arid regions. For instance, the introduction of intensive horticultural technologies will be an important task. These offer an alternative way of utilizing vast areas of land for extensive agriculture. In this case, generally in arid regions, an increased percentage of land is used for livestock breeding when agricultural production becomes difficult. This is a factor one should not forget. It is necessary, especially in arid regions, to plan and implement projects that harmonize agriculture, forestry and fisheries, including livestock breeding.

Moreover, setting aside the important issues of irrigation and securing water resources for agriculture in arid regions, there are other problems unique to these regions. In order to cultivate under severe climatic conditions in arid regions, fields and crops have to be protected from shifting dunes. Therefore, the creation of wind/sand breaks and the development of sand dune fixation technologies are extremely important. Also problems of salt accumulation and water logging arise when water with high salt concentrations is constantly used for irrigation or where the underground water table is high. To cope with these potential problems, knowledge and technology regarding drainage is important. Furthermore, the natural vegetation in arid regions is often drought-resistant and/or salt-resistant. It is also important to promote basic studies concerning the physiology and ecology of these plants, and apply the knowledge that is thereby gained to the field of plant breeding and biotechnology.

It is obviously necessary to attempt to produce crops by creating favorable conditions, and, as far as possible, by eliminating and overcoming what are perceived as bad conditions; in the case of arid regions, these are high temperature, drought and strong winds. At the same time, there exists an alternative way of thinking that considers these conditions more positively as unique to arid regions. In arid regions, crops are produced under conditions which precipitate high evaporation rates. The results are vegetables/crops that have concentrated levels of minerals etc. It is this concentration of ingredients that forms the basis of the concept of "nutrient rich vegetables". In particular, in the case of medicinal plants, this has even more important implications. If one tries to artificially grow plants which originally live in severe arid environments in a milder environment and with a better water supply, in many cases their medicinal quality becomes much less efficacious compared to the same plants growing in the wild. This is because plants are not producing their medicinal components to benefit humans, but are instead accumulating special ingredients in their bodies to protect themselves from drought.

Because of the points described above, AAI began to make efforts to create a data base of plants unique to arid regions, and to collect the seeds of such plants. Dealing with endemic plants creates another big challenge, namely, that of understanding the relationships that exist between the plants and human culture/traditions of the area in which the plants occur. Appropriate technologies based on these culture/traditions have been kept alive in local areas for many years. In the field of overseas assistance and technical cooperation, employment of appropriate technologies and intermediate technologies are being advocated. It seems that what leads to improvements in local people's lives is a combination of scientific analysis, evaluation, and the improvement of those indigenous technologies that are rooted in particular regions.