

# The Role of Technology Transfer in the Sustainable Conservation of Agro-biodiversity in Arid and Semi Arid Zones

JAMAL ALRUSHEIDAT\*

Jel classification: Q 320; Q 280

## 1. Introduction

The world's population is predicted to double and, perhaps, even triple by the end of this decade. According to Hamdy (2001), it is expected to reach 12 billion by the year 2030. Ninety percent of the projected increase will take place in Developing Countries (Alexandratos, 1987). The number is increasing every second and the need to supply these billions with food has become the biggest challenge facing such nations.

The population of the Arid and Semi-Arid Zones is around one fifth of the world's population. According to Rajan and Hassan (2004), over 50% of Developing Countries are located in this region. Such growth is associated with economic activities that will dramatically increase the pressure on natural resources which already suffering serious levels of degradation.

The magnitude of the task, facing Developing Countries in general and technology transfer in particular in conserving agro biodiversity, is immense. Training about conservation practices is very important. However, such training was never given the necessary attention. The challenge presented will, no doubt, continue for decades to come. For this reason, it is very necessary to improve the capabilities of education and training institutions to produce well-trained human personnel required for making science and technology intelligible for conserving agro biodiversity.

## 2. The Problem ... The Situation

Not until the end of the last century, biodiversity has become the focal point of recent research studies, developmental projects, public concerns and new interests of scientists, conservationists and environmentalists. At the Rio De Janeiro World Earth Summit, organized in 1992, terms such

### Abstract

The article presents the most important factors affecting biodiversity and how governments, international agencies, and institutions acted to stop deterioration of the plant cover and how did they succeed in increasing floral population. Achievements of technology transfer in some countries are described. Obstacles facing such implementations and reasons of low participation of local communities are viewed. Some achievements of Third World Countries and experiences on the ground are discussed.

### Résumé

*Cet article présente les facteurs les plus importants qui ont un impact sur la biodiversité et les actions entreprises par les gouvernements, les agences internationales et les institutions afin de freiner la détérioration de la couverture végétale et d'augmenter la population florale. Les résultats du transfert technologique dans certains pays sont aussi décrits. Les obstacles empêchant ces réalisations et la raison de la participation limitée des communautés locales sont également discutés. L'article offre une analyse des résultats atteints dans les pays en développement et des expériences sur le terrain.*

as conservation, agro biodiversity, global warming, and many others emerged as an alarming bell for the deterioration of global lands. Countries of all regions realized the importance of conserving the precious plants grown for thousands of years. Agro biodiversity was viewed as a global challenge that concerns all world countries.

Due to the increasing pressure on natural resources caused by human

expansion, growing demands for food and fiber and the use of inappropriate practices, particularly in developing countries, agro-biodiversity has become under siege. As Hamdy (2001) indicated, the main problem is how to feed the additional billions without destroying our planet.

He believed that the situation is more complicated in developing countries, where 80% of the world's population lives.

The growing interest in conserving agro-biodiversity has become an urgent need for most Arid and Semi-Arid Countries due to the fact that they present an essential source of genetic variation for breeding improved varieties and are the home to hundreds of thousands of wild relatives and landraces. The importance of such interests was widely recognized as a critical issue addressed by many governments.

Concerned about the alarming status of limited interests in agro biodiversity conservation, the last few decades have witnessed an increased concern about the importance of increasing awareness about the relevance, importance, and value of these plants through technology transfer practices. Shifting attitudes of people to become medicinal and herbal plants-friendly has become the main concern. It was realized that it is so important to conserve these valuable resources for future generations before they disappear forever.

What is clear is that despite the growing interests in conserving agro biodiversity by governmental agencies, N-

\* Director/Technology Transfer Department; National Center for Agricultural Research and Technology Transfer (NCARTT), Jordan

GO's, and the private sector, our plant cover was still confronted by man-made rather than with man-avoided disasters.

### 3. What Technology Transfer Can Do

Meeting the increasing demands for food and fiber is not an easy task. It requires extensive efforts by all institutions, especially technology transfer offices, extension departments, research institutions, NGO's, and ordinary citizens. Technology transfer is considered an essential component of any development process.

Effective biodiversity conservation requires maximum efforts from technology transfer departments. It can be achieved only through active participation of local people and if the economic and social benefits of conserving lands are maximized. No doubt that technology transfer can solve many problems if accompanied by generous funds spent on research and development, and certainly, without ignoring social factors. To be more successful and beneficial, it must meet local needs, willingness of people and their priorities. Recognizing and understanding socio-cultural aspects can affect the rate of adoption, lay the base for good management, better skills, and improve participation as well (Alrusheidat, 2004).

Technology transfer plays a vital role in helping poor families cope with poverty. With the help of local organizations, technology transfer can teach and introduce people to other non-traditional sources of income and help them find other alternatives. Only when poor people are relieved from the mounting stress of poverty they will engage voluntarily in conservation efforts. Technology transfer can teach poor people how to grow medicinal plants as a good source of income since they are widely spread and have high market demands. What is needed is to encourage people to adopt growing and using such plants. However, the important thing to remember is what Mwangi (1998) emphasized as important factors needed for adoption. He believed that for successful technology transfer, it is crucial to understand farmers' needs, priorities, opportunities, problems, and barriers to adoption. It is worth noting what Pachauri (1998) believed. He mentioned that if technology is responsible for causing a problem, it is technology that can correct that problem.

### 4. Some Achievements on the Ground

Plant genetic resources provide the resource base and raw materials for breeding new varieties of cereal crops, fruit trees, and other crops that can be drought and disease resistant, have high tolerance to salinity, and can adapt to climatic changes. In many Developing Countries, there is a growing evidence of an increased public awareness about conserving agro biodiversity. For example, in Jordan, recognizing the importance of bio diversity, the National Center for Agricultural Research and Technology Transfer (N-CARTT) has initiated different steps in this regard. A spe-

cial program was created to deal with conserving agro-biodiversity through in-situ and ex-situ practices. An agro-biodiversity project was completed recently and another project started to encourage growing medicinal and herbal plants. Another important step in this regard was the creation of a gene bank. Through technology transfer, conserving agro-biodiversity was introduced in school curriculum, and public awareness campaigns resulted in many successful stories of conserving the plant cover in farmers' fields and backyards.

Sincere efforts from all parties involved must be done to assess the needs of local people, especially the poor. A good example in this regard is what the Government of Jordan has done to stop overgrazing and destroying the plant cover in desert and Badia areas. The need for food has forced settlers (Bedouins) to cut shrubs to feed their cattle or to use them for cooking purposes. They harvested all green plants to eat or sell at local markets, making many rare species extinct. After studying the situation, technology transfer and water and soil specialists taught the people how to use the very limited amount of rainfall by using water harvesting techniques, creating special terraces and planting drought-tolerant species. Lands were protected from overgrazing; cutting shrubs was reduced, soil erosion was minimized, vulnerable plant and animal species were protected, and as a result, the plants cover was restored.

Dana Nature Reserve, a protected land in the southern region of Jordan, is another example where technology transfer introduced the advantages of conserving biodiversity to local communities and described the benefits they might achieve. Technology transfer specialists trained local people, including women, to benefit from the reserve area through sustainable tourism, creation of different jobs, and eliminating poverty (Ajlouni, 2004). The project would have never succeeded without full participation of all parties involved. It was obvious that farmers were willing to adopt new practices only if given enough support and encouragement (Disi and Damhoureyeh, 2004).

Another good example in this regard is what the Egyptian Government has done to conserve agro-biodiversity. Overgrazing and cutting shrubs by desert settlers, accelerated the extinction of many rare species. The results were devastating and catastrophic in many areas. The government attempted to restore the plant cover for many years, but it was unsuccessful. It was realized that in order to convince settlers about the importance of conserving biodiversity, they must get some benefits. It is worth mentioning that the common sense used by technology transfer specialists to stop degradation of the plant cover and to restore vegetation in desert areas was unique. They supplied desert settlers with kerosene stoves and heaters to use instead of the shrubs they cut. Many settlers found that using such stoves saved them not only time and efforts, but also made them settle in one area and made their life easier and cleaner. The project was successful since it eliminated the cutting of

shrubs and conserved whatever was left.

Chile adopted a successful project where thousands of hectares were replanted with rare palm trees that caused immediate improvement (Moreno and Fernandez, 2004). Successful efforts were coordinated between research institutions, technology transfer, and the private sector. Useful information about the palm trees was published through publications and research articles, as well as university projects. The founders of the project provided local people with seeds, information, and practical courses on how to plant and use the palm. Such initiatives have resulted in providing people with other sources of income and helped spread awareness amongst school students about the importance of such palms. Throughout the project, the involvement of local people was taken into account by helping them to build greenhouses and assisting them in their afforestation efforts.

In Uzbekistan, a bio-drainage project was created in the country. Protective Forest Stands were created to protect both agricultural and wild lands, where special trees were planted and not harvested, but left to grow naturally. The project was created to reduce soil salinity as well as lowering the water table. Botman, Honazarov, and Kayimov (2004) indicated that this technique not only improved the micro-climate, but also created a favorable environment for soil micro-flora and made soil productive.

Gene banks are another successful example of conservation of rare plants and wild species. Tens of thousands of seeds of wild landraces and other species are stored at the main headquarters of the International Center for Agriculture in the Dry Areas (ICARDA). Tunisia, Jordan, Syria, Morocco, Iran, and many other countries of the region have adopted the same technology of conservation for their rare species.

In Madagascar, a project was initiated to develop the potential of *Eugenia Jambolana* seeds used for the treatment of diabetes. Until 1970, much of the valuable resource was ignored and left to go to waste. The trees were either ignored or cut, destroying the plant cover. The trees were never exploited effectively to produce what is called java plums. Technology transfer specialists trained people to identify ways of using the plants and its fruits. The challenges of the project were to discourage people from cutting the trees which they used as fuel and in construction. Among the many positive impacts of the project are the many job opportunities and nutritional values they gained from using the trees, in addition to conserving the valuable kind of trees. It was a successful project implemented through cooperation of different agencies including technology transfer specialists (Urverg-Ratsimamanga).

## 5. Conclusions

- Good protection of endangered ecosystems has become a crucial element of today's economy.
- Agro-biodiversity is of great significance at the social, e-

conomic, cultural, and environmental, as well as aesthetic levels.

- Technology transfer must be planned carefully and must consider interest of technology providers and technology users.
- Technology transfer must meet the priorities and needs of local people, thus increasing the likelihood that they will be involved.
- Sustainable development on a global scale will require radical technological and related changes in both Developed and Developing Countries.
- Social factors play a crucial role in speeding or slowing technology transfer process.
- Public awareness campaigns must include all segments of the population and pay more attention to school students and women's organizations.
- More emphasis is needed on identifying rare and endangered species and potentially profitable species of many widely used medicinal plants based on market needs.

## References

- Ajlouni, M. (2004). Dana Nature Reserve: Jordan. Sharing innovative experiences. Examples of the successful conservation and sustainable use of dryland biodiversity. Volume 9. UNDP.
- Alexandratos, N. (1987), Editor. World agriculture toward 2000. Food and Agriculture Organization, Rome. Belhaven Press. A division of Pinter Publishers, London.
- Alrusheidat, J. (2004) Preventing environmental problems in the Arid and Semi-arid Zones-Environmental education is what we need. NEW MEDIT. IAMB Mediterranean Agronomic Institute of Bari. Vol. III. No.3.
- Botman, E.K., Honazarov, A.A., Kayimov, A. K (2004). Protective forest stands: Uzbekistan. Sharing innovative experiences. Examples of the successful conservation and sustainable use of dryland biodiversity. Volume 9. UNDP.
- Disi, A. and Damhoureyeh, S. (2004). Conserving biodiversity in the Badia region: Jordan. Sharing innovative experiences. Examples of the successful conservation and sustainable use of dryland biodiversity. Volume 9. UNDP.
- Hamdy, A. (2001). Biotechnology for the 21st century: opportunities in agriculture. MEDIT No.3.
- Moreno, M., Fernandez, M.P. (2004). Managing the world's longest-living palms: Chile. Sharing innovative experiences. Examples of the successful conservation and sustainable use of dryland biodiversity. Volume 9. UNDP.
- Mwangi, J. (1998). The role of extension in the transfer and adoption of agricultural technologies. Journal of International Agriculture and Extension Education. Spring1998, 63-67.
- Pachauri, R. K. (1998). Better environment and natural resource management discussion. Climate Change and technology transfer. Tata Energy Research Institute. New Delhi. India.
- Rajan, R. and Hassan, M. (2004). Sharing innovative experiences. Examples of the successful conservation and sustainable use of dryland biodiversity. Volume 9. UNDP.
- Urverg-Ratsimamanga, S. (year not listed). *Eugenia Jambolana*: Madagascar. Sharing innovative experiences. Conservation and wise use of indigenous and medicinal plants. Vol.7.