The income generated from vegetables, such as okra, grown in the BDL especially helps women feed their families better.

In the Sahel, women are a marginalized sector of society as they are not allowed to own or cultivate arable lands. However, women are allowed to accept large parcels of degraded lands that usually are the property of the community. Women’s groups are formed to cultivate such degraded land, and each woman is allotted a parcel of land inside the large BDL field. In 2007 one hectare of okra planted in the BDL gave revenue of US$ 6,000, which is 50 times higher than the revenue generated from one hectare of millet, and it is more than enough to cover all set-up costs.

The Dryland Eco-Farm (DEF)

The DEF is an innovative tree-crop-livestock rainfed farming system. Fast-growing, drought tolerant Acacia tree species are integrated into cropping systems together with rainwater harvesting. This combination restores and protects the soil, increasing soil fertility and organic matter, recycling nutrients, reducing erosion and rendering the land productive enough to grow higher-value crops. Profit potential from the DEF is 3-5 times higher than from current farming systems.

**Conclusion**

Through the years the collaborative efforts of ICRISAT and MASHAV have helped in mitigating the effects of desertification as well as improving the lands and livelihoods of the poor and marginalized farmers in the SAT of Africa. Yet that is not all. More and better methods have to be developed and disseminated for Africa’s Green Revolution to take root and thrive. In these efforts ICRISAT and MASHAV must continue to soldier on, so that Africa can have a better and brighter future.

Israel and ICRISAT in India

“Recently Israel executed its biggest agriculture development initiative anywhere in the world, in India, which entails potentially tens of millions of dollars worth of cooperative projects in water-waste management, horticulture, etc.,” said H.E. Mark Sofer, Israel’s Ambassador to India. MASHAV and ICRISAT are in discussions to work together in India too.

**Partnership with MASHAV in dissemination of technologies and crops**

MASHAV provides strong support to the International Program for Arid Land Crops (IPALAC), which was created in 1996 by a group of scientists from the Ben Gurion University in Israel through a grant given by UNESCO. Israel, through MASHAV, joined UNESCO and Finland in 1997 and since that time has been a dedicated supporter of this program. IPALAC has been managed by ICRISAT from its hub in Niger since 2001.

Innovative modes of cultivation that employ a combination of ingenious technologies, systems, and high-value crops are used for the betterment of livelihoods, incomes and nutrition of the poor in the semi-arid tropics of sub-Saharan Africa. They include:

**The African Market Garden (AMG)**

Urban areas in dryland Africa are willing to pay for high-value fresh produce from ‘market gardens’. This is a major opportunity to raise incomes of the poor and to connect them with larger markets including exports. The AMG, developed by IPALAC for small-scale African producers, features an inexpensive, easy-to-maintain, low-pressure drip irrigation system that saves water and labor while multiplying yields and profits.

**MASHAV and ICRISAT**

Collaborating for Africa’s Green Revolution

**Introduction**

Israel’s Membership in the CGIAR

The Consultative Group on International Agricultural Research (CGIAR) and Israel’s Ministry of Agriculture, advanced research institutes, and the Israeli Department of International Cooperation, MASHAV share many goals – help alleviate poverty, sustain agricultural production, and protect the environment in desert prone regions. The ICRISAT-Israel collaboration was enhanced when Israel joined the CGIAR in 2002.

ICRISAT and MASHAV are working together to overcome the problems faced by the poor in the semi-arid tropics of Africa. The Government of Israel and ICRISAT are in a collaborative research partnership to help the poor farmers in these regions.

Israel has much relevant experience and technology to offer that can help Africa overcome its many problems. ICRISAT is interested in partnering with Israel in making the Green Revolution happen in Africa.

**ICRISAT and MASHAV**

In February 2007, ICRISAT and MASHAV signed a formal MOU to expand MASHAV capacity building to support and supplement ICRISAT research in sub-Saharan Africa.

The interactions between the two organizations lead to new ways to strengthen, deepen, and broaden the collaboration between ICRISAT and Israel. With wholehearted support, first from Prof. Dan Levanon, and then from Dr Yuval Eshdat (Chief Scientist, Ministry of Agriculture, Israel), scientists from ICRISAT and Israel have been working together from mid-2006 on joint projects of mutual interest.

ICRISAT is also interested in developing new modes of collaboration. The highlights of this mutually beneficial collaboration for development of the semi-arid tropics of Africa are described in this flyer.

**Conclusion**

Israel and ICRISAT are in discussions to work together in India too.
The African Market Garden, despite being a low-pressure drip irrigation system, has all the advantages of the pressurized system at a fraction of its cost. ICRISAT developed three versions of the AMG system: the thirsty version of 300m² units, the commercial AMG with a 500m² unit, and the cluster system where a large number of 500m² units are clustered around a central reservoir. The cluster system is the most successful of the three and future dissemination work will be based on this system.

ICRISAT, in cooperation with MASHAV has installed 300 units of the AMG in Cradock, South Africa. ICRISAT implemented a program for installation of 300 African Market Garden units in nine Sahelian countries. This program was co-financed by Israel and the Vatican. On the whole, over the last six years, 2,000 units of African Market Gardens have been installed in 11 countries of dry West Africa (Cape Verde, Mauritania, Senegal, Gambia, Guinea-Bissau, Mali, Ghana, Burkina Faso, Niger, Benin, and Chad) and South Africa. Over the next five years another 15,000 units will be installed in Ghana, Cape Verde, Senegal, Burkina Faso and Benin. This new activity will be financed by several agencies including the American World Jewish Service and MASHAV (Senegal). After the AMG in West Africa attains critical mass it will continue to spread on its own steam, resulting in the addition of thousands of AMG units in the landscape of West Africa. So far ICRISAT has assisted in the installation of 2,000 AMG units in 12 Sahelian countries. The AMG activity is currently concentrated in Senegal and Benin.

The African Market Garden (AMG) system developed by ICRISAT is being installed in Africa and Europe. The AMG is a low-pressure drip irrigation system developed by the Techno-Agriculture Innovation for Poverty Alleviation (TIPA) project co-funded by MASHAV and the American Jewish World Service (AJWS).

The project is an initiative of the Israeli Embassy in Senegal and works towards dissemination of the low-pressure drip irrigation system. The project is carried out by NGOs and other organizations with the technical assistance of ICRISAT and the guidance of the Israeli Embassy in Dakar.

In this project ICRISAT uses the AMG cluster system initially developed by TIPA in South Africa and perfected by ICRISAT in Ghana. The program is using quality vegetable varieties selected and developed by ICRISAT. ICRISAT's role in this program is to give technical assistance to all TIPA initiatives generated by the Israeli Embassy in Senegal. The ICRISAT technical advisor’s activities and priorities are determined and coordinated by the Embassy. Through the TIPA project 460 units of the AMG will be installed by the end of 2008.

Capacity building in Africa and Israel

Each year, MASHAV together with FinnMark, supports two regional courses given by Israeli experts at the Niger hub of ICRISAT. One course is focused on nursery technologies and the other on vegetables seeds multiplication. In each course there are about 30 participants from four countries – Senegal, Mali, Burkina Faso and Niger. Afterwards, course graduates start small nursery and seed production enterprises using fruit and vegetable germplasm selected by ICRISAT.

In November 2007, MASHAV and ICRISAT co-organized a workshop in Israel for directors of World Bank financed projects in West Africa on the subject of Development of agriculture projects – opportunities for cooperation. This workshop helped both MASHAV and ICRISAT to fit into World Bank development programs in West Africa.

Expanding the collaboration

Several novel methods of sustaining and extending the new systems on the ground are constantly being worked out. Some of them are discussed below.

Development of the ‘Farmers of the Future’ education program

The agriculture system of the Semi-Arid Tropics (SAT) of sub-Saharan Africa is basically a subsistence system wherein subsistence farmers consume whatever they produce. Transforming the mind-set of these farmers from a subsistence mode to a market-oriented approach is a necessary step for achieving food security in Africa’s SAT, but it is a slow, lengthy process.

This process can best be accelerated through education and training. Keeping this in mind ICRISAT-Niger is developing an education program for primary school children aiming at the creation of a new generation of farmers that are market oriented, aware of the environment, and open to innovation. This program called Farmers of the Future (FOF) is being tested in the primary school of Sadore village in Niger. Some components of the FOF program are: vegetable production using low-pressure drip irrigation, tree grafting in FOF nursery, tree planting, fruit production, innovative dryland systems, and learning to invest. MASHAV has decided to support the development and dissemination of the FOF program.

Capacity building of NARS scientists on high-value crops

Training and capacity building is a central pillar of ICRISAT-MASHAV collaboration. MASHAV is now considering building the capacity of West Africa’s scientists in the field of horticulture research. In this plan ICRISAT will collaborate with the Faculty of Agriculture of the Hebrew University of Jerusalem in building the capacity of scientists of the National Agriculture Research Institutes (NARIs) and scientists from West African universities in the fields of vegetables and fruit trees research.

A regional training program for Francophone Africa at ICRISAT-Niamey

The ICRISAT Center in Niger is slowly evolving into a training and capacity building facility for the region in addition to its main function as a research center for the Sahel. The two annual training courses given by MASHAV experts are part of this new development. MASHAV and ICRISAT are considering the expansion of this joint activity that will allow the former to reach a larger number of trainees than it is currently accomplishing through its training centers in Israel, and its mobile courses.

Dissemination of new technologies and systems developed by ICRISAT

Land degradation is the major environmental problem in sub-Saharan Africa’s semi-arid tropics particularly in the Sahel. This problem results in less land for food production and therefore less food production per capita. Solutions for these problems, such as the Bio-reclamation of Degraded Lands (BDL), are increasing productivity of arable lands and helping in the recuperation of degraded lands.

The BDL technology includes: fencing of large plots of degraded land; demarcation of individual plots; scarification of the crust formed on the surface that prevents water infiltration; construction of water harvesting structures such as micro-catchments (demi-lunes), trenches and planting

The BDL technology utilizes several kinds of techniques in the service of better productivity.