FEEDBACK from the field

AVRDC The World Vegetable Center

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This bulletin provides information about application of AVRDC's technologies in the field and other topics of interest regarding vegetable production and consumption constraints around the world. It is issued quarterly. We welcome everyone to share any interesting news about vegetables – please send a short article with photos to tech_dissemination@worldveg.org. Thank you!

Garden-based learning in Asia: greener and healthier kids?

Students work in the school garden at Paciano Rizal Elementary School, Philippines ***(left)****; school garden established in Thailand* ***(right)****.*

From 2003 to 2006, AVRDC implemented a school garden activity in Lao PDR, Thailand, and the Philippines. This was a component of an Asian Development Bank (ADB)-funded project, "Promoting utilization of indigenous vegetables for improved nutrition of resource-poor households in Asia (RETA 6067)" that institutionalized the use of indigenous vegetables (IVs) in the school garden curriculum of elementary schools in selected Asian countries.

Vegetable school garden activities are basically outdoor classes in a garden-based environment. Previous research has shown that eating habits are developed early in a child's life and are carried through adulthood. Developing interventions and effective nutrition programming at an early stage are therefore being looked into as tools for promoting healthy dietary patterns. A garden-enhanced nutrition curriculum has been found to improve the knowledge of elementary schoolchildren about nutrition and even their preferences for some vegetables. Other studies also found positive relationships between garden-based nutrition education and fruit and vegetable consumption, and related psychological behavior and knowledge in elementary schoolchildren.

Ten elementary schools participated in this garden-based activity: three sites each for the Philippines (Tranca, Paciano Rizal and Masaya) and Thailand (Ban Sao Dieo School, Ban Lung Pra Du School and Ban Ta Ang School), and four in Lao PDR (Phosy, Nong Phaya, Haddokkeo and Houaha). To gather support from both school teachers and students, schools were provided with training activities on gardening from December 2003 to December 2004. In addition, they were also given several key items like *Trichoderma* as a biocontrol agent for fungal diseases, water pumps, watering cans, fencing materials and tools to ensure water supply for these gardens, and in some instances, seeds. Partnerships with government institutions like the Department of Science and Technology-Philippine Council for Agriculture, Forestry and Natural Resources Research and Development; Department of Agricultural Extension and the Tropical Vegetable Research Center at Thailand's Kasetsart University; and the Haddokkeo Horticulture Research Center in Lao PDR, also ensured regular monitoring of the school gardens in each country.

When designing the gardens, Thailand's basic school garden layout was used as a model. Small fruit and leafy vegetables were planted in the designated area using tree vegetables on the perimeter. An area was also set aside for climbing vegetables that require trellises.

Different species of IVs were raised and harvested in each country. In Lao PDR, thirteen species of IVs were planted on approximately 3000 m^2. In the Philippines, seventeen species were selected for cultivation, i.e., upland kangkong, amaranth, jute, cowpea, vegetable soybean, hot pepper,



*Collecting the blood samples **(left)**, measuring the height **(middle)** and mid-upper arm circumferences **(right)** of children in Vientiane, Lao PDR.*

eggplant, okra, pole snap bean, bottle gourd, bitter gourd, Malabar spinach, snake gourd, roselle, tomato, ridged gourd and sweet potato. In Thailand, the vegetables grown were leafy vegetables (amaranth, Malabar spinach, Chinese cabbage, Chinese chives, kangkong), pulses (yard-long bean, winged bean), and other vegetables (angled luffa, smooth luffa, cucumber, okra, tomato, eggplant, pepper, sweet basil, and holy basil). Tree vegetables (sesbania, sauropus and acacia) were used as a perimeter fence.

The pilot gardens were monitored regularly and cultural maintenance was done when needed. After harvest, parents and schoolchildren in Thailand and the Philippines brought the harvested IVs home and cooked them. Schoolchildren were asked to log the kinds of IVs they took home and what their families did with them to monitor their use of harvested IVs. To encourage support from parents and children, a series of promotional activities were conducted, such as indigenous vegetable cooking demonstrations for women, IV parties in schools, and spot quizzes of common IVs grown in the school gardens among children with prizes as incentives, among other things. In the Philippines, follow-up orientation seminars were held to inform schoolchildren of the inclusion of the project in their 'Edukasyon Pantahanan at Pangkabuhayan Curriculum' (Home Economics).

The effects of the school garden activities on health of schoolchildren were assessed using anthropometric surveys and measurement of knowledge of IVs. Anthropometric surveys of children were administered at baseline and at the conclusion of the project. Measurements on height, body weight, mid-upper arm circumferences (MUAC) and blood samples were collected. Baseline surveys were done in 2003-2004 in Thailand, Lao PDR, and the Philippines with a total of 611 children. Some schools acted as a control (no school garden) to determine effects of this intervention. There was a significant drop in the number of children (N=455) as participants observed at post-test due to attrition: households transferred to a new residence unknown to the school administrators, children moved to a different school, and some children were sick.

Overall, the school garden intervention proved to be successful in increasing knowledge of indigenous vegetables among schoolchildren. Schoolchildren from the intervention sites in Thailand have performed comparably better than those from the other two countries, as the Thai children led in terms of IV exposure and knowledge. When comparing anthropometric scores before and after the intervention, results showed significant improvements due to the intervention for haemoglobin levels of boys from the Philippines and Thailand. The average boy in Lao PDR was still slightly anaemic even after the intervention. Lao PDR, however, showed the greatest improvement due to the intervention in terms of the decline in the prevalence of stunting and underweight among the children.

Source and photos:
Christian Genova, Socioeconomics, AVRDC-The World Vegetable Center


***Left & right:** House-to-house interviews of schoolchildren during summer break at Ban Nong Phaya, Vientiane, Lao PDR.*

Bottle drip irrigation enables vegetable production during the dry seasons in Tanzania

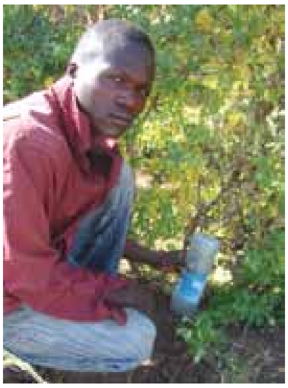

Ms. Elly Emanuel applies bottle drip irrigation for her eggplant field in Moshi Rural of Kilimanjaro Region in Tanzania.

Throughout Tanzania there are two rainy seasons: the long rainy season starts in March and ends in May/June, and the short rainy season is from November to January. Sowing or planting takes place prior to each rainy season while harvesting is usually carried out immediately after the rainy season. To ensure irrigation for vegetable cultivation, farmers have to plant just before the start of the rainy seasons either in March or October, and this results in peak vegetable production during July to September, which means vegetable prices are generally low during this period. However, if farmers can use water efficiently during dry seasons, they may obtain higher market prices. Bottle drip irrigation can be a good solution for efficiently watering vegetables during dry seasons.

Mr. Musa Lema is an experienced vegetable farmer in Manyire village which is located in Arusha Region, Tanzania. He grows various vegetables by applying bottle drip irrigation during dry seasons. Musa makes 4-5 small holes with a nail on the bottom or the cap of the mineral water bottle. Then he fills the bottle with water and screws on the cap to keep insects and debris out of the water reservoir. The water bottle is inserted into the soil approximately two inches and then the water will slowly flow into the soil and be absorbed by plants. The number of water bottles to be used will depend on the bottle availability, planting density, growth stage of plants and size of the vegetable farm. If vegetables are planted closely, one water bottle can irrigate several plants. However, if the spacing is wide, one water bottle can be used to irrigate only one or a few plants. The water bottles are replaced every two to three months.

After all the water is absorbed by the plants, Musa hangs the water bottles in his vegetable crops to help him remember easily where he placed the bottles earlier. This can also minimize the risk of the bottles being taken by other people. Due to shortage of water, Musa does not irrigate his crops continuously. After filling a water bottle two or three times,

Mr. Musa Lema hangs the water bottles in his bitter gourd farm after the water was absorbed by the plants to minimize the risk of losing the bottles or having them taken by other people.



***Left**: Mr. Musa Lema applies bottle drip irrigation to his bitter gourd farm.*

***Right**: The empty bottles will be refilled with water to be inserted into the soil for irrigation.*

Ms. Julita Rafael, 13 years old, is a grade 6 student from Msasani Primary School located in Kibosho Moshi; she applies bottle drip irrigation in the home nursery and also uses bottles to water her ornamental plants.

Some farmers are using bottle drip irrigation to water banana.

he usually waits for two weeks before refilling the bottles again to irrigate the same crop.

Fertilizers can be applied efficiently through the bottle drip system. Musa mixes fresh cow dung in water at a 5:1 ratio, stirs the mixture well, and lets it ferment for 7-9 days. After that, the solution is ready to apply. It is first diluted by adding the same amount of water and then the liquid manure fertilizer can be applied to vegetables through bottle drip irrigation.

Drip irrigation with mineral water bottles is an easy way of watering plants. It requires less than half of the water needed for flood or furrow irrigation. Water is applied directly to the plant root zone. No applications are made between rows or in other non-productive areas, therefore this results in better weed control and significant water saving. Furthermore, there is no power or piping required for supplying water and no cost is involved.

Musa's vegetable farm has become a demonstration site for bottle drip irrigation. When other farmers or visitors are interested in applying bottle drip irrigation, Musa shows them the proper application. He further explains the features and benefits of bottle drip irrigation to nearby farmers as well as neighboring villagers/visitors. A number of farmers are practicing bottle drip irrigation and using the water from streams, groundwater and shallow wells as the main water source.

Musa said bottle drip irrigation can be used for various vegetables, including bitter gourd, pumpkin, amaranth, African eggplant, sweet pepper, cucumber, cabbage, Ethiopian mustard and other crops. Before using bottle drip irrigation, he needed to spend more than five hours a day to collect the water from furrows to water his vegetables. After applying bottle drip irrigation, he saves lots of time. Water run-off and evaporation are reduced, and irrigation becomes more efficient.

Source and photos:
Inviolate Mosha, Regional Center for Africa in Tanzania, AVRDC-The World Vegetable Center

Women farmers are developing grafted tomato seedling businesses in Bangladesh

Women farmer nursery group in Potangani village of Jessore District demonstrate tomato grafting technology.

Jessore is a district located in the Khulna Division of southwestern Bangladesh. This district produces a variety of crops year-round. Tomato is one of the most important and popular vegetable crops there. It is usually grown in the cool season (November to March). High temperature and humidity during summer (April to October) can cause poor fruit set and disease problems. However, the demand for tomato runs throughout the year. Some farmers have started to plant tomato in summer and have been successfully applying the AVRDC and Bangladesh Agricultural Research Institute (BARI) promoted "summer tomato production technology" since 1996. Many summer tomato growers have earned high profits, which have helped them build brick houses and support their children's schooling. However, most farmers are landless and they continue growing tomato in the cool season on rented land for years. Bacterial wilt has become one of the major constraints for tomato production.

To manage the gradually emerging bacterial wilt problem, AVRDC has promoted tomato grafting technology through the USAID-funded project, "Improving income, nutrition and health in Bangladesh through potatoes, sweet potatoes and vegetables." Fifteen women farmers from Jessore district attended a training workshop on tomato grafting and

Women farmer nursery group in Mallikpur village of Jessore District graft tomato scions onto eggplant rootstocks.

Seedlings of tomato scion 'BARI #4' and eggplant rootstock 'EG203' ***(left)*** *raised in women farmer nursery in Potangani under simple shelter with plastic sheet on the top and surrounded by green netting* ***(right)***.

Modified grafting chambers in Potangani ***(left & right)*** *and Malikpur* ***(middle)***.

improved seedling production techniques on 10 June 2012. The objectives of the training were to train the women farmers on tomato nursery management and link them with summer tomato growers to create business opportunities.

The fifteen women farmers were divided into three groups with five members per group. They work 1-2 hours a day together as a team to run each nursery. All the women farmers successfully applied the tomato grafting technology they learned from the training and each group set up one nursery. To reduce costs for each nursery, the project field coordinator worked with the women farmers to modify the grafting chamber to a simpler, smaller and more cost-effective design by using locally-available materials. The modified grafting chamber was made with five pieces of wood and covered with a plastic sheet on the top. Clay soil is used to seal the gaps between wooden planks and the ground. After grafting, the grafted seedlings were transferred to the modified chamber for 3-4 days. The survival rate of grafted seedlings is 85% in one nursery and 60% in another.

The project installed one sign in front of each nursery with the message: "Summer tomato grafted seedling production by a women's farmer group; Scion: BARI #4, Rootstock: EG203", and it caught many tomato farmers' attention when they passed by. Farmers visited the nurseries and inquired about the grafted tomato seedlings. Most of them eventually purchased or ordered grafted seedlings. One nursery sold 200 grafted seedlings, and another 500 grafted seedlings in early September 2012 for BDT 6 (USD 0.07) per seedling. Locations of the nurseries are at or near the tomato production areas, which provides good marketing opportunities for women farmers to sell the grafted seedlings to tomato farmers. The women have had no marketing problems so far and they all want to set up their own nurseries next year.

Source and photos:
Mandy Lin and *Greg Luther,* Global Technology Dissemination, AVRDC-The World Vegetable Center

AVRDC - The World Vegetable Center
Global Technology Dissemination
P.O. Box 42, Shanhua, Tainan 74199
Taiwan

T +886 6 5837801
F +886 6 5830009
E tech_dissemination@worldveg.org
I www.avrdc.org

Facebook: http://www.facebook.com/pages/Feedback-from-the-Field/169530259752510

Editors: *Mandy Lin* and *Greg Luther*, Global Technology Dissemination
Layout: *Vanna Liu,* Communications & Information