



With a population of 110 million of mainly rural-based people compressed on 148,393 km<sup>2</sup>, Bangladesh presents one of the greatest challenges in the world to produce more food on less land. CARE's Local Initiatives for Farmer Training (LIFT) project has worked with farmers for more than 8 years to develop strategies to do just that: produce more with less. LIFT is implemented in both the southern and northwest regions of Bangladesh, bordering the Bay of Bengal and India, respectively.

## Producing more with less

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**B**oth areas experience a tropical monsoon climate from June to October with an average rainfall of more than 600 mm per month. The dry and cooler winter season lasts from November to February. LIFT works here with a population of poor male and female farmers who generally own less than an acre of land. Their small and usually crowded homesteads are used for a multitude of activities, often competing for space and light. For many Bangladesh households, the homestead itself represents all or a large proportion of the entire landholding. The gardens measure usually less than 1 decimal (approximately 40 m<sup>2</sup>). Finding ways to make these limited areas produce more vegetables without the use of expensive or toxic inputs has been one of the challenges of-LIFT.

### New approach needed

Many years back, CARE promoted high-input horticulture to small farmers as a way to increase income. This resulted in a small number of farmers producing exotic vegetables for a small and affluent segment of the population in the capital city of Dhaka. Vegetable production became a cash crop, controlled mostly by men. These vegetables were and continue to be produced using high amounts of expensive inorganic fertilisers and toxic pesticides for urban markets. The level of pesticide use in vegetables, the poor understanding of pesticides by the farmers themselves and the lack of any testing for pesticide residues continue to be cause for alarm.

Although substantial economic gains were realised for some farmers, little was achieved in terms of increased vegetable consumption for households in rural areas, another goal of the project. This is not surprising since vegetable production for household consumption is typically the responsibility of women and done within the homestead, neither of which were targeted in the original programme. As a result, a new LIFT approach was developed to promote bio-intensive gardening. It was to rely on the use of local inputs, labour and traditional vegetable crops in the homestead. The programme works with both women and men but, more realistically, activities are directed at households.

### Selecting technologies

LIFT itself has gone through many changes to get to where it is today: a very participatory project which trains local female and male extensionists to promote bio-intensive gardening in the communities where they live. Farmers are also encouraged to operate tree nurseries on their small homestead (see box) and sell vegetable seedlings and seeds to neighbours on a "for-profit" basis. Through a process of trials and evaluation in the gardening programme, the project now focuses on fewer practices which make the largest contribution to the goal of increased production for limited areas of land, with minimal external inputs. Use of vine crops help make best use of limited space. Composting, live fences and liquid fertiliser enhance productivity of crops. And these, together with the use of raised beds, enable continual cropping almost throughout the year.

### Experimenting with vine crops

One commonly used cropping strategy in Bangladesh, refined by the programme, is the planting of vine crops which utilise limited ground area yet have high production. Sweetgourd (*Cucurbita maxima*), ash-gourd (*Benincasa hispida*), spongegourd (*Luffa cylindrica*), bottlegourd (*Lagenaria siceraria*), Indian spinach (*Basella alba*) and country bean (*Dolichos lablab*) are the most commonly grown vine crops. Typically, these crops are grown in "pits", an area about 30 cm in diameter where the soil has been loosened to about the same depth, manure added, and six or more seedlings are planted. The pit is often next to the house or a homestead tree where the plant can grow up onto the roof or the branches. Often a trellis is constructed to provide the plant with support which then provides cooling shade during the day.

LIFT has improved production for vine crops by increasing the pit size, increasing the quantity of compost added and reducing the number of seedlings planted per pit. Although the experiments were not designed well enough to determine which change had the greatest impact on bottlegourd production, all changes made probably contributed positively to the overall increases observed. While the average production level from a single pit was 88 kg, the range was from 45 kg up to 161 kg, indicating the potential high yields from a limited space. Trials for other common vine crops have yet to be undertaken.

### Soil fertility

Composting is a first method promoted by LIFT to enhancing soil fertility and structure, resulting in increased vegetable production per area of land. Traditional com-

posting is usually done in open pits and relies primarily on animal manure and small amounts of rice straw, resulting in poor-quality compost and loss of nutrients. LIFT composting is promoted above ground, under cover, and encourages the use of all farm wastes as well as abundant water hyacinth. LIFT also promotes live fences around all garden spaces. Fencing is not practised by all farmers in Bangladesh, and the fences which are built are often of poor quality. Considerable losses of crops to livestock often result. The most commonly used live-fence tree is *bogamedula*, a fast-growing perennial legume. The leaves of *bogamedula* contribute to soil fertility either through compost or as green manure in the garden. The stems provide for fuelwood. The fence itself is also used as a support for vine crops.

Increased production per area of land is also achieved by applying liquid fertiliser. Many types of leaves which are high in nitrogen are common in rural villages, but not necessarily within the homestead. Liquid fertiliser offers small landholders the opportunity to use these leaves to fertilise their vegetables in the homesteads. Clay pots are filled with water and a bag of leaves from nitrogen-fixing trees (5 l water : 1 kg leaves). After 2-3 weeks, the liquid is rich in nitrogen. After being diluted with 3 parts of water to one part of liquid fertiliser, it can be applied directly to the garden and pit crops. This free source of nitrogen fertiliser has been widely accepted by farmers as it increases production, does not burn the crops and, if applied to leaves, repels insect pests.

### Continual cropping

In Bangladesh, vegetables are usually produced only during the cool winter season between November and February. Little is grown in the remaining months of



Photo: CARE

*Eggplant, kangkong and red amaranth on raised beds, vine crops growing on a fence. April is normally very difficult for vegetable cultivation due to heat and drought.*

the year. A number of crops, however, can be grown in these months if soil fertility is properly managed and vegetables are grown in raised beds. They offset the problems with heavy rainfall (drainage), and composting improves the water-holding capacity and provides nutrients to the soil, which are taken out by continual harvesting. By relaying in different types of vegetables (fruit, leafy, root and leguminous), continual production of vegetables is achieved throughout the year. Raised beds improve root growth, soil aeration and water drainage.

Farmer-managed trials compared the production of radish (*Raphanus sativus*) planted in the traditional way versus raised

beds, using similar quantities of compost. The average production of radish grown in the traditional way yielded 169 kg per decimal, while the raised bed yielded an average of 208 kg per decimal, an increase of 23%.

### Conclusion

By using the above methods, rural households can substantially increase vegetable production in their very small gardens. In the project villages average monthly production levels have increased from 10 kg to 40 kg per month for the average one decimal garden. Almost 70% of this is consumed within the household and the remaining 30% is sold in rural local markets. Even the small plots thus provide cash for household necessities.

Further, not only is it no longer necessary to buy vegetables, but villagers know that what they consume is fresh and not tainted with pesticides or other chemicals.

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### The viability of micro nurseries

As an alternative income-generating activity for very small homesteads in Southern Bangladesh, CARE promotes the establishment of micro nurseries. Building on the age-old practice of raising vegetable seedlings in the homestead, the production of tree seedlings is now stimulated to meet the demand of many afforestation activities. Operated for profit, such nurseries are expected to provide a sustainable source of income for the household. As the homestead is mostly the domain of women and women generally have limited opportunities for outside paid labour, the project works mostly with them. Women nursery managers receive training from the project and regular support visits. All materials and inputs required are the responsibility of the women themselves. Almost 38,000 marketable seed-

lings were thus produced and sold in the first season with an average of 625 trees per nursery, showing a wide variety of species.

Profitability of the nurseries during the first season was carefully monitored. It appeared that, on average, net income to labour amounted to 2029 taka (about US\$ 50) with more than 75% of the nurseries making more than 1000 taka. The total labour requirement to complete a nursery production cycle was determined to be 32 days of 8 hours' work. One day of work thus earned the women an average of 67 taka or US\$ 1.60. Comparing this with the average daily labour wage in Chittagong of 40 taka per day for men and 15 taka per day for women indicates that the nurseries are economically attractive, especially for women. Much of the time devoted to the nursery work is often "idle

time" with low opportunity costs. Further, the timing of the nursery income was said to be important. Much of this income is earned during the monsoon when outside employment opportunities are scarce.

Where some form of vegetable production is common on the homestead, the loss of this source of income needs to be taken into account. Interestingly, however, nursery managers have started to plant vegetables between the larger coconut seeds or poly bags, utilising the unoccupied root space below. The loss of vegetable production is therefore partly compensated for, while best use is made of the very limited space available.

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