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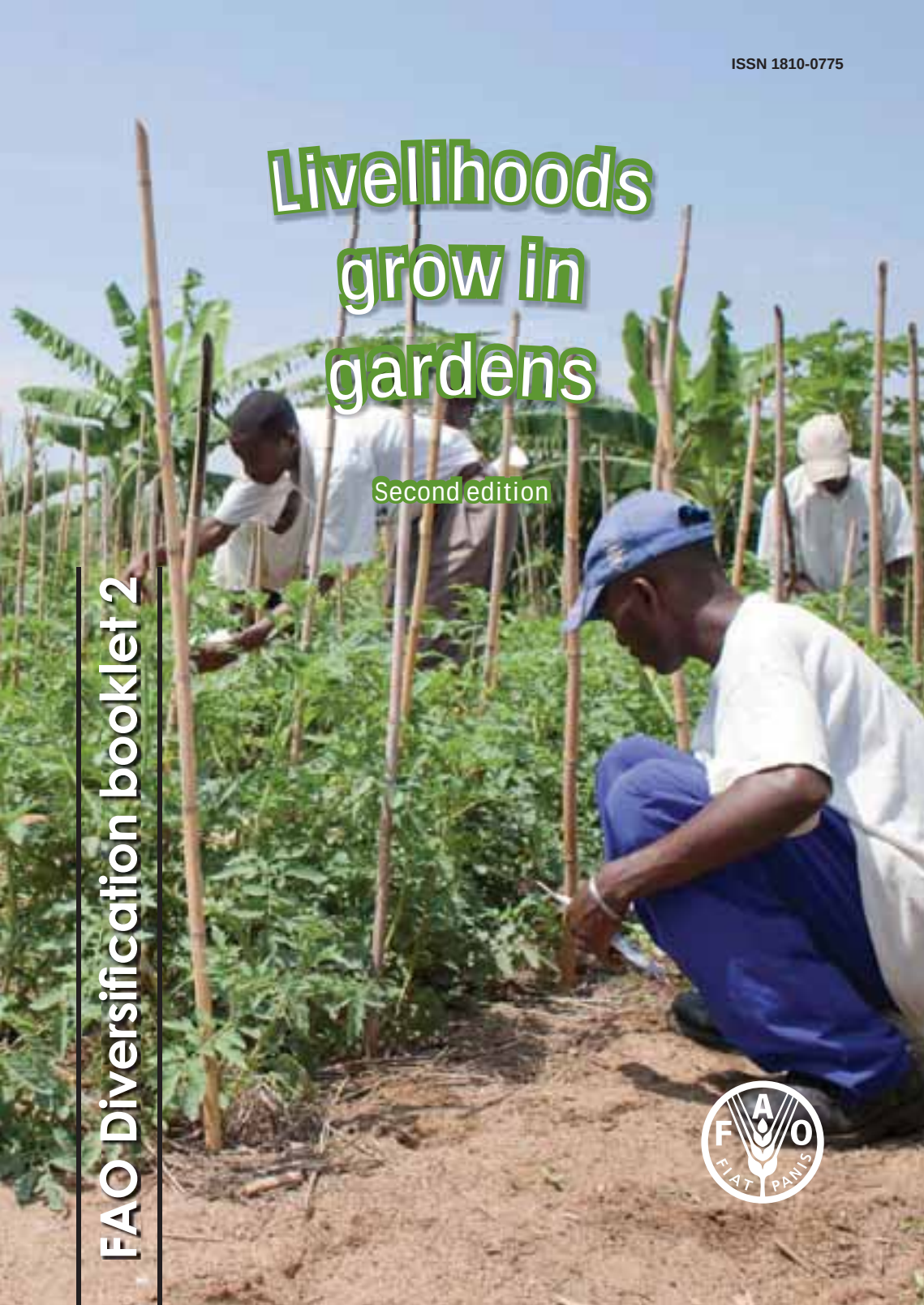
Livelihoods grow in gardens

Second edition

FAO Diversification booklet 2



Diversification booklet number 2

Second Edition

Livelihoods grow in gardens

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Preface

The purpose of the FAO Diversification booklets is to raise awareness and provide decision support information about opportunities at farm and local community level to increase the incomes of small-scale farmers.

Each booklet focuses on a farm or non-farm enterprise that can be integrated into small farms to increase incomes and enhance livelihoods. The enterprises profiled in the FAO Diversification booklets selected are suitable for smallholder farmers in terms of resource requirements, additional costs, exposure to risk and complexity. The products or services generated by the enterprises are suitable for meeting demand on a growing, or already strong, local market and are not dependent on an export market.

The main target audience for these booklets are people and organizations that provide advisory, business and technical support services to resource-poor small-scale farmers and local communities in low- and middle-income countries. It is hoped that enough information is given to help these support service providers to consider new income-generating opportunities and how these might enable small-scale farmers to take action. What are the potential benefits? What are farmer requirements and constraints? What are critical 'success factors'?

The FAO Diversification booklets are also targeted to policy-makers and programme managers in government and non-governmental organizations. What actions might policy-makers take to create enabling environments for small-scale farmers to diversify into new income-generating activities?

The FAO Diversification booklets are not intended to be technical 'how to do it' guidelines. Readers will need to seek more information or technical support, so as to provide farmer advisory and support activities relating to the introduction of new income-generating activities. To assist in this respect, each booklet identifies additional sources of information, technical support and website addresses.

A CD has been prepared with a full series of FAO Diversification booklets and relevant FAO technical guides, together with complementary guides on market research, financing, business planning, etc. Copies of the CD are available on request from FAO. FAO Diversification booklets can also be downloaded from the FAO Internet site.

If you find this booklet of value, we would like to hear from you. Tell your colleagues and friends about it. FAO would welcome suggestions about possible changes for enhancing our next edition or regarding relevant topics for other booklets. By sharing your views and ideas with us we can provide better services to you.

Acknowledgements

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Acknowledgements for the series

Gratitude is owed to Doyle Baker, Senior Technical Officer, Rural Infrastructure and Agro-Industries Division (AGS), FAO, for his vision, encouragement and constant support in the development of the FAO Diversification booklet series. Martin Hilmi managed the development, production and post-production of the series and provided technical support and inputs. Michael Breece undertook the design and layout of the booklets and desktop publishing.

Introduction

Gardens and agriculture

People have had gardens for thousands of years. It is not so hard to imagine: fruit, vegetables and grains gathered from the wild were taken to family huts for meals. Some seeds fell to the ground; other seeds were released after the fruit had been eaten. The seeds germinated and grew, and were cared for by those in the family who knew what the plants were. People settled were food plants grew, and learned to cultivate and breed them. Living near the garden made it easier to water and protect the crops from foraging wildlife, and was less work than gathering food from the wild.

Gardens are ancient forms of agriculture, and with the current issues of growing population, scarce resources and food crises, gardens can provide many people with improved livelihoods.

FIGURE 1 Homes and gardens: an ancient association. A traditional forest garden in Southeast Asia has a diverse mix of species in a random structure, which reduces risks of serious losses to pests, diseases, and climate variation, while also providing dietary diversity. (Photo by C. Landon-Lane)

Broad scale agricultural techniques evolved from simple, manually-worked gardens; even today in many parts of the world the difference between farms and gardens is blurred. The main visible differences are important and telling: agriculture is a defining feature of rural areas, but not urban areas; while gardens are found in both rural and urban areas; gardens generally cover a smaller area than farms, yet they have a wider diversity of crops and livestock. Using small plots of land or even plant pots in urban high-rise apartments, gardens can be established and maintained with little capital and labour to provide a range of products including food, fuel, herbal medicines, and environmental services like shade, beauty, and organic waste disposal.

Garden types may be divided according to their primary purpose. Structure and function are closely related. **Home gardens** have a long history of adapting diverse plants and small livestock to meet a range of household needs and conditions, mixing traditional and new technologies. Home gardens often combine the natural functions of a forest with the socioeconomic needs of the people. The natural functions of a forest encompasses hydrologic and erosion control, gene bank, and microclimate effects, whereas its socioeconomic functions include subsistence and commercial production, and social and aesthetic values.

FIGURE 2 Growing lettuce in a micro-garden on a roof terrace
(Photo: FAO/22166/A. Casset)

Market gardens are larger, and have more specialized production systems to supply specific commercial markets. While commercial orientation makes market gardens a mainstream form of agriculture, both home gardens and market gardens make significant contributions to livelihoods.

FIGURE 3 A home garden in Viet Nam
(Photo: FAO/21340/J.M. Micaud)

FIGURE 4 A young man in Mali watering his market garden where salad vegetables and mint are grown
(Photo: FAO/22994/I. Balderi)

Gardens, market potential and livelihoods

A small-scale farmer or a group of small-scale farmers can make choices on the size and nature of the garden system and its purposes, depending on their livelihood strategy and business plan - priorities, resources and market opportunities. Some market gardens are run by community or cooperative groups on community land, particularly in urban and peri-urban areas, providing members with food, income, and skills development. Many people in the increasing urban population establish or join community gardens to maintain a direct link with agriculture, as a buffer against fluctuating food supplies and prices, and often simply to have the varieties of food they prefer.

Intensively managed, gardens can be highly productive all year round in tropical and mild temperate areas. They can be worked seasonally to avoid difficult cold or dry seasons, or managed part-time to fit in with other livelihood activities such as daily employment, fishing and farming. A garden can be a significant health and livelihood asset amongst urban households.

Garden diversity can include vegetables, fruit, staple foods, livestock, aquaculture and nursery production; plants and livestock that produce fuel and fibre; plants for medicinal use[1], and plants for social or spiritual functions such as flowers. All these items not only have an economic value in the livelihood system and may be traded but offer more and diverse market opportunities for small-scale farmers and others involved in gardens.

In addition to the direct livelihood contributions for consumption and income, a garden area can support other livelihood activities as work area and a place to store products and equipment. Gardens strengthen well-being through providing space and products for social functions, and environmental services like privacy and protection from sun, wind, and dust.

[1] See also FAO Diversification booklet: No. 17 *Health and wealth from Medicinal Aromatic Plants*. Also fit for gardens are other enterprises covered in the FAO Diversification series: No 1 *Beekeeping for sustainable livelihoods*; No. 3 *Products and profits from poultry*; No. 4 *Value from village processing*; No. 5 *Processing for prosperity*; No. 6 *Milk for health and wealth*; No. 7 *Make money by growing mushrooms*; No. 9 *Sheep and goats for diverse products and profits*; No.11 *Growing vegetables for home and market*; No. 12 *Non-farm income from non-wood forest products*; No. 13 *Farm ponds for water, fish and livelihoods*; No. 14 *Small animals for small farms*; No. 15 *Pigs for prosperity*; No. 16 *Fruit products for profit*; No. 18 *Selling street and snack foods* and No. 20 *Spices and herbs for home and market*.

CASE STUDY 1 **Famous gardeners**

While Nelson Mandela was a prisoner in South Africa, he grew vegetables, at one time up to 900 plants. This improved his diet, the diet of fellow prisoners and even the prison wardens. In Viet Nam, Ho Chi Minh practiced and promoted a traditional mixed gardening system integrating fruit trees, vegetables, fishponds and livestock. These gardens helped many people survive years of war and famine, and provided a platform for recovery assisted by agricultural diversification. Michelle Obama (see Figure 5) started a kitchen garden at the White House, with local students involved in producing vegetables to be cooked in the White House Kitchen and given to Miriam's Kitchen, which serves the homeless in Washington DC.

FIGURE 5 The White House kitchen garden
(Photo by J.N. Boghosian , courtesy of The White House)

Potential benefits from integrating gardens into livelihood systems include:

- Income and enhanced employment through additional or off-season production;
- Improved household food security;
- Increased availability of food and better nutrition through food diversity;
- Decreased risk through diversification;

- Alleviation of seasonal food shortages and seasonal supply bottlenecks of labour, transport, power or equipment;
- Local environmental benefits from recycling water and waste nutrients, from shade, dust and erosion control and from maintaining or increasing local biodiversity;
- Education and skills development;
- Strengthening communities.

Despite the considerable potentials gardens offer, the contribution of gardens to livelihoods is often wrongly considered too small and their establishment too complicated for inclusion in urban and rural development policy and investment projects. Economists and even households themselves sometimes find it hard to describe and value all of the benefits from diverse gardens.

Planners, researchers, community development and extension officers often lack the information to identify situations where garden programmes can achieve policy goals, and the skills to plan and evaluate garden programmes. Gardening is traditionally handled as a minor activity by specialized horticulturists in agriculture research and extension institutions, independent of field crop, livestock and aquaculture institutions.

Increasingly the health benefits of gardens are perceived by public health organizations, but they need linkages with expertise. In an urban context, there is often a need for local government, NGOs and community groups to collaborate. To introduce gardens for livelihoods successfully, policy-makers and planners must take sufficient account of diverse and often location-specific economic, cultural and environmental conditions.

Purpose of the booklet

The main objective of the booklet is to create awareness about the numerous opportunities available for improving livelihoods through appropriate garden technologies and organizational structures. This book provides examples of successes and lessons learned, and points out considerations that are crucial to the successful integration of gardens into livelihood systems around the world. Further the publication will help development specialists to understand the livelihood benefits of gardens and how they can be integrated with other components of livelihood systems. The main focus is on semi-intensive, small-scale, diverse and integrated gardens for food, income and well-being.

Garden advantages

Enhancing local agriculture and food security

Gardens, and the people who work them, help local agriculture to develop and diversify by exchanging knowledge of practices and technologies, trading seeds and animal breeds, and also by sharing knowledge and/or collaboration in marketing. Some skills and technologies learned and developed in a garden later support local agriculture. In a community with gardens there are always different crops and small livestock at different stages of production, resulting in a fairly regular supply of surplus garden produce for trade in local markets, and for supply of farm inputs such as seeds and livestock for growing on. A regular supply of local produce supports the viability of local markets, which in turn provide growers the sales outlets for income. People tend to trust and prefer local markets and food from local gardens and agriculture. Gardens enhance this interdependent system of local agriculture, markets, and local consumers.

Farm work efficiencies can be gained by integrating a garden into a farming system. Nursery beds can provide advanced seedlings, which when planted in fields require less weeding and take more rapidly than when seeded directly as field crops. Winnowing, drying, milling and other post-harvest processing may be more efficiently done near a home and a garden (see FAO Diversification booklet No.4 *Value from village processing*). Working in the garden near drying crops ensures that they can be brought in from rain; a gardener can also keep watch for browsing domestic animals. Waste from crops processed in or near the home garden provides feed for livestock and compost for garden fertilization.

Field crops are usually cultivated as a monocrop - a single species all planted at the same time - in order to maximize growth and labour efficiency. This low species diversity increases the risk of loss from disease and pests, which easily multiply and spread under such conditions. Planting the crop at a single time exposes it to loss by drought and bad weather. In contrast to this, a home garden's high species diversity and staggered planting times increase the

FIGURE 6 Diversity enhances food security: A garden in Burundi where cassava, sweet potatoes, beans and bananas grow
(Photo: FAO/23927/M. Bleich)

likelihood that some crops survive (see Figure 6). In the Philippines and the Pacific Islands, for example, patches of taro (*Colocasia*) grown in gardens ensure that a family has food after a typhoon or tropical cyclone has wiped out other crops. Plants such as the onion family (*Allium* sp.) and neem tree (*Melia azadirach*) are planted in gardens to repel pests. Shade and shelter for the home also protect the home garden crops, which is not the case in open fields. The home garden also provides a secure place to process and store crops.

Supply of agricultural inputs is often controlled by large state or private corporations, which may offer only a narrow range of high-volume items such as fertilizer and main crop seeds such as rice and maize. In contrast, viable gardens require a wide range of high-quality vegetable, herb and spice seeds, grafted fruit trees, young livestock for fattening, materials for pest exclusion and environment modification, and services such as para-veterinary services. This diverse demand provides additional trade opportunities for local entrepreneurs.

Schools, training centres, research institutions and extension services can also benefit from this demand for inputs, services and products. When research and development is applied to the innovations being made in gardens, viable commercial applications often result. Many of the improved varieties of fruit and vegetables popular in markets today were originally selected by observant and skilled gardeners.

Breeders of plants and livestock have for centuries utilized the diversity of genetic resources to improve productivity and choices. Gardens enhance the diversity of local agriculture. Agricultural diversity strengthens food security by reducing the risk that an economic shock, unusual weather, disease, or market failure will affect all of the diverse forms of food, their means of supply, or the sources of income to purchase food.

When climate and other factors caused global food price crises in 2008 and 2010, people with gardens were buffered from the worst impacts by having a living food store and ability to adapt the garden quickly. At such times of food security stress, the food and income potential from diverse gardens greatly increases household resilience and reduces vulnerability. Leafy green vegetables can grow rapidly (see Figure 7) and edible leaves can be taken from them soon after planting, without harvesting the whole plant. Intensive, inexpensive, fast growing garden systems and varieties have been researched and promoted in many countries by the Asian Vegetable Research and Development Center (AVRDC) through its headquarters in Taiwan, Regional Center for Africa in the United Republic of Tanzania, and collaborative research with research and development stations in many countries.

Food security from traditional gardens comes not only from vegetables, tree crops and small livestock, but also root crops and 'emergency store' food plants used mostly as living fence and for fuel. In Southeast Asia and the Pacific Islands emergency food is available from plants such as the roots of the hardy shrub *ti* (*Cordyline humilis*) that survive cyclones and salt water inundation. In Africa and Central America, plants are cultivated that can withstand drought or plague locust and still yield some food, such as seed from certain Acacia trees, cassava roots, and fruit prickly pear cactus (*Opuntia sp*.).

FIGURE 7 Fast food: Leafy vegetables can be plucked daily from as soon as two weeks after planting in a home-made pottery dish
(Photo by C. Landon-Lane)

Improved nutrition, diet and health

Adequate nutrition is not only dependent on the quantity of food available. The range of food must provide the range of essential vitamins, minerals, and oils besides protein and carbohydrate. Gardens provide many of the nutrients essential for an adequate diet for healthy life:

- Carbohydrate starches derive from root vegetables like potato, sweet potato, taro, banana, cassava and yam;
- Carbohydrate sugars derive from many kinds of fruits;
- Protein and oils come from beans, seeds and nuts;
- Vitamins and minerals from fruit and vegetables.

Many population groups subsist on diets based on staple plants that are lacking in diversity, which contributes to micronutrient deficiencies. Such malnutrition prevents people from reaching their full potential – mentally, physically or financially. It also contributes to higher death rates from heart disease, stroke and cancer. Vitamin A deficiency and iron deficiency particularly affect

children and women during their reproductive years. Almost one-third (about 250 million) of preschool children in developing countries are affected to some degree by Vitamin A deficiency. Iron deficiency, which leads to anaemia, is recognized as the most common dietary deficiency in the world, even in developed countries.

Vitamin A and iron deficiencies have been reduced and kept at low levels in many countries through promotion of gardens and nutrition education, providing Vitamin A-rich green leafy vegetables, and orange and red-coloured vegetables and fruit. Vegetables are the most affordable and sustainable dietary sources of vitamins, trace elements and other bioactive compounds. Gardens not only provide vitamin A, but anti-oxidants like Vitamin C, iron and other micronutrients for a healthy diet (see Table 1). Gardens not only offer increased production of micronutrient rich foods from gardens, but also home processing increases their bio-availability such as through fermentation, germination, and preparation of diversity in the home diet.

TABLE 1 **Micronutrient quantity from vegetable sources**

Vitamin A	>2 000 international units	Amaranth, dark green leafy vegetables, Malabar spinach, kale, water spinach, leaf lettuce and carrots
B vitamins	>17 mg/g	Legumes, taro and horseradish leaves
Vitamin C	>20 mg/g	Amaranth, squash, cabbage, kale, capsicum, tomato and bitter gourd
Calcium (Ca)	>20 mg/g	Amaranth, lettuce,kale, mustard, spinach, beans, onion, cabbage, turnip green and soybean
Iron (Fe)	>3 mg/g	Amaranth, dark green leafy vegetables, lettuce, spinach and chillies
Phosphorus (P)	—	Spinach, beans, lettuce, onions, tomatoes, cabbage, cauliflower, broccoli and collard greens
Iodine (I)	—	Onion, okra and asparagus
Protein	—	Beans, grams, soybean and cowpea

Source: Adapted from AVRDC 1990. Vegetable production training manual, Asian Vegetable Research and Development Center, Shanhua, Taiwan

CASE STUDY 2 **FAO and peri-urban horticulture**

It is estimated that 130 million urban residents in Africa and 230 million in Latin America engage in agriculture, mainly horticulture, to provide food for their families or to earn income from sales. While the urban poor, particularly those arriving from rural areas, have long practised horticulture as a livelihood and survival strategy, in many countries the sector is still largely informal, usually precarious and sometimes illegal. But that is changing rapidly.

Over the past decade, governments in 20 countries have sought FAO's assistance in removing barriers and providing incentives, inputs and training to low-income "city farmers", from the burgeoning metropolises of West and Central Africa to the low-income barrios of Managua, Caracas and Bogotá.

Through multidisciplinary projects, FAO has helped governments and city administrations to optimize policies, institutional frameworks and support services for peri-urban horticulture, and to improve horticultural production systems. It has promoted irrigated commercial market gardening on urban peripheries, simple hydroponic micro-gardens in slum areas, and green rooftops in densely populated city centres.

The FAO programme, and similar initiatives by partner organizations, have demonstrated how horticulture helps empower the urban poor, and contributes to their food security and nutrition. But it can also help grow greener cities that are better able to cope with social and environmental challenges, from slum improvement and management of urban wastes to job creation and community development.

Source: FAO. 2010. Growing greener cities, Rome

FAO, Helen Keller International and many other agencies have successfully improved community nutrition through school gardens, urban home gardens, and promotion of 'nutrition gardens' for young women in rural communities. With skills in growing gardens, understanding nutrition and how to prepare tasty food for a balanced diet, young people are less vulnerable to dietary-related diseases, including iron deficiency in young women, vitamin A deficiency in infants, and obesity, diabetes, and heart disease related to unbalanced diets dominated by heavily processed foods.

One of the traditional roles of women is caring for small children. During advanced pregnancy, a woman should not do heavy manual field work or endure long days with insufficient regular food, in order not to risk her own or the baby's health. Infants need regular breast-feeding and attention. After six months, a child needs more than breast milk alone and complementary foods need to be provided. Being at home during these months is the best situation: home gardens help to

FIGURE 8 Care and nourishment in a kitchen garden in Bhutan. Mother and baby thrive with only light work around the home and garden. Green vegetables are a good source of dietary iron to prevent the fatiguing condition of iron anemia common in expectant and nursing mothers.
(Photo by C. Landon-Lane)

provide profitable but light work, and a mother can look after her own and her child's health and nutrition. Nutritious food is available from the home garden every day; it can be prepared freshly and safely at home. Feeding an infant will also be easier at home.

Increased household income

Gardens can be used to increase household income, not only directly by selling fresh or value-added production, but also by providing food that would otherwise have to be purchased with household income. While growing more than the household can consume and selling the seasonal surplus can provide some income, better income is achieved by aiming for market opportunities. For example, in all but the coldest and driest climates, vegetables can be planted and harvested for most of the year. Two market opportunities are to grow vegetables all-year round to supply customers regularly; and

growing off-season vegetables to sell when there is little else available in markets (see FAO Diversification booklet No. 11 *Growing vegetables for home and market*). Another opportunity is to specialize in growing certain kinds or varieties of vegetables, fruit, herbs, spices and other items that few other people produce for sale.

Fruit and nut trees are often a good source of income. Trees often bear fruit or nuts at different times of the year compared to staple food crops. In tropical climates, papaya (*Carica papaya*) and banana may be harvested almost year round. In subtropical areas, fruits from South America, such as passionfruit (*Passiflora edulis*) and avocado *(Persea americana*), and from Asia, such as mandarins (*Citrus sinensis*) and jujube (*Ziziphus jujuba*) are harvested from autumn into winter, when few other fruits are available (see FAO Diversification booklet No. 16 *Fruit products for profit*). In temperate areas, relatively non-perishable nuts such as walnut (*Juglans regia*), and cashew in dry areas (*Anarcardium occidentale*), provide useful food and trade items that can be stored at home or sold in markets.

FIGURES 9 & 10 Characteristics for income: Passionfruit vines can be very productive, and the juicy fruit pulp is protected by a durable skin. In its native Brazil and now in many other countries, it is eaten alone or combined with other foods. Street vendors, restaurants and hotels buy it to make delicious fruit juice blends.
(Photo by C. Landon-Lane)

FIGURE 11 Food and income if you need it: Harvesting prickly pears for market in northern Chile. In dry parts of Latin America the prickly pear or tuna (Opuntia sp.) is planted as a fence to keep livestock out of gardens. Harvesting the fruit is uncomfortable, but the plant requires no other work or inputs. If people are short of food or cash, the prickly pear is harvested and marketed; in good seasons for other crops, people sometimes don't bother to harvest it for sale.
(Photo by C. Landon-Lane)

Adding value to garden products is another good income strategy. Adding value may be as simple as shelling nuts to sell only the kernels, as they become more convenient for consumers. Washing, grading and weighing vegetables into home-meal sized lots is another simple, but effective convenience value addition. With extra inputs, time, expertise and equipment, as simple as a kitchen, value adding to garden products transforms them into take-away snacks, or dried and preserved foods (see FAO Diversification booklet No.5 *Processing for prosperity* and FAO Diversification booklet No 18 *Selling street and snack foods*. In the mountain areas of Nepal, for example, where there are only walking tracks to reach markets, people add value to garden vegetables by drying,

grinding and packaging them as soup and curry mix. The high value to weight and durability of the products means they can be carried to market and return an income.

Farmers and gardeners have always had good seasons and bad ones. Drought, disease and high food prices can push people into food shortage and poverty. One way to balance these risks is to maintain some perennial plants that can be harvested only if necessary, thereby avoiding large labour investments for meagre returns. Astute home gardeners the world over have planted hardy, low-value crops on marginal land. Jujube (*Zizisyphus jujuba*) and tamarind (*Tamarindus indicus*) grow wild and in gardens in seasonally dry areas from Africa to the People's Republic of China and the Pacific Islands. Fruit can be eaten fresh or dried for storage. Cashew nuts are quite tolerant of drought and require minimal post-planting care, widely grown by poor farmers on marginal land from Brazil to Mozambique and Viet Nam. In a bad season for food crops, cashew can provide a small but much needed source of cash.

Opportunities for women, youth, the elderly and the disabled

In all countries, certain groups are vulnerable to food insecurity, poverty and poor social standing. Gardening is often used to reduce a family's vulnerability. In urban areas across the world, food crops are grown on rooftops and balconies, in backyards and community gardens, alongside roads and in vacant lots. They provide fresh, marketable food that supplements family diets and boosts family incomes. Urban and peri-urban gardens can fill critical food-supply gaps for poor city dwellers, particularly where rural infrastructures and farm-to-market distribution systems are poor.

Disabled and elderly people are often considered non-productive dependents in a household. Limited care of a home garden, post-harvest and value-adding activities provide them with safe and feasible opportunities to contribute to household food and income.

Garden systems are readily accessible to the poor. While gardening for subsistence is common and valuable to the household, gardens offer a way to generate a small income rapidly. A small investment in seeds and a small amount of labour can provide a return from the sale of vegetables within six to eight weeks. Limited access to land is often a characteristic of poor families, but need not be a major constraint - a home garden can be established on a small area.

Women in many societies do most of the work that is essential for childcare, feeding the family, and maintaining a healthy household. With these ties, women often cannot access income opportunities to improve their livelihoods. Gardens provide women with opportunities to earn income independently, to gain experience in commerce, and provide pathways for empowerment. This publication does not aim to promote gardening as women's work only – men should be involved – but work in a home garden is readily integrated into the daily household chores that traditionally fall on women. Community groups for women, youth, elderly and handicapped may be financially sustained by sales of garden products and value adding. In the Solomon Islands, for example, the Kastom Gaden Association has assisted women and the elderly to learn how to grow vegetables, and in Mali, women grow melons in the off-season when the fields cannot grow rice. Women, youth and elderly gardeners in a community organization in Fiji, for example, join together in the community group's kitchen to make and bottle pickles, sauces and jam out of their own garden products[2]. Value-added products are sold under the group's brand and start-up and running costs are shared. In each of these cases, gardens now provide income and empowerment for women and the elderly, whereas previously they were restricted to subsistence chores.

[2] FRIEND Inc. Lautoka, Fiji 2009. For more details see http://www.fijifriend.com/about/about.html

FIGURE 12 Valued role: An elderly Cambodian woman is still able to contribute to household food production at home, drying beans next to a home garden.
(Photo by C. Landon-Lane)

FIGURE 13 A group of women cultivating lettuces in a collective garden (Photo: FAO/18931/G.Bizzarri)

Greater return from labour, particularly for women and girls, helps to balance the household workload, most of which is usually done by women. Studies of daily household routine have shown that although men and women may appear to work an equal number of hours each day, chores such as preparing meals, childcare, cleaning, livestock care and fetching water and firewood are often not fully considered. These tasks most often fall to women and are centred on the home.

School gardens and farms have traditionally been limited to either vocational training for senior students, with a side-benefit of food and income for the school. There has been increasing recognition of their potential to address some of today's biggest crisis points: nutrition, the environment, livelihoods and education. In all these areas, school gardens are making a proven contribution to children's wellbeing, understanding and life prospects. FAO's manual (2005) and teacher's toolkit (2009) '*Setting up and running a school garden*' helps schools, governments and NGOs to establish gardens and to make them successful. The manual and toolkit is used in developing countries in Africa, Latin America and Asia. Developed countries also have begun school

garden programmes[3] , especially in response to modern health and nutritional problems such as diabetes and obesity, to increase awareness of the environment and food, and to instil in children the knowledge that they can grow their own food. As early as 1869, many countries in Europe made school gardens compulsory to help improve community resilience[4].

[3] Burns, J. 2010. *Biological Farmers Australia Organic School Gardens Program approaches 1000 registered schools*, Australian Certified Organic Magazine, Brisbane, Australia

[4] Forrest, M. & Ingram, V. 2003. School Gardens in Ireland 1901-24, *Garden History*, Vol.31. No.1. Garden History Society, London

BOX 1 **School gardens**

Not just the classroom, but the whole school environment is involved in children's development. The school grounds are:

- A source of food for improving children's diet and health;
- A source of healthy influences (clean drinking water, physical activity, hygienic latrines, washbasins, school meals);
- An area for learning (about nature, agriculture, nutrition);
- A place of recreation (flowers and trees, shade, play areas, eating areas);
- A continuing lesson in respecting the environment and taking pride in one's school.

FIGURE 14 Life skills. Children at work in a school garden supervised by their teacher who is watering a tree seedling. A school garden not only adds nutrition and reduces costs of school lunches, but also provides learning opportunities that can be linked into a curriculum. (Photo: FAO/19734/G. Bizzarri)

FIGURE 15 Part of the home environment. A mixed garden and pond in Viet Nam makes use of household waste, fish in the pond keep drainage water healthy and reduce mosquitoes, it shades and cools the house area, keeps down dust and mud – and provides food and amenities.
(Photo by C. Landon-Lane)

Environmental benefits

The ecological association between people and plants in a garden is an ancient one. People and plants thrive in places that have adequate shade, shelter, light, water and nutrition. This makes for better working conditions for:

- highly intensive enterprises such as poultry and pig raising, nurseries, market gardens or floriculture;
- post-harvest processing or value-adding activities;
- non-farm employment such as clothes making and carpentry.

Home gardens can provide environmentally sound opportunities for waste disposal. Composting is commonly used for household wastes including kitchen waste, paper and other materials which are then used to enrich the soil.

In flood-prone areas such as the Ganges delta in Bangladesh, gardens can literally anchor the family home. Plants like taro, coconut

and thatching palms hold the soil together while inundated. In response to regular floods in the Mekong delta, Vietnamese people have built pontoon-like houses that float during floods. Garden trees adapted to the irregular floods and rich soils, for example palms (coconut, sago and betel), banana and durian, continue to provide protection around the floating house.

With proper attention to hygiene and food safety, gardens can be watered with the wastewater from laundry, kitchen and bathing. Increasingly, local authorities promote simple recycling technologies for household water and waste, including composting and biogas production to provide garden nutrients and generate energy. To reduce food safety risks and negative environmental impacts, gardens need to use good agricultural practices (GAPs). Safe food from gardens needs safe water for irrigation and washing products, and soil and air free from contamination, and particularly in urban areas this in turn relies on local governments that have effective capacity for land use planning and environmental management.

The garden as a livelihood activity

Diversification, innovation and market entry

Like all forms of agriculture, gardening today involves environmental modification, ranging from intensive systems such as greenhouses, where all aspects of plant life cycle are managed, to extensive systems such as fruit orchards, which may receive little care after planting. Gardens are places where innovation is nurtured, prior to expansion as a main livelihood activity or small enterprise. Technical and market developments have benefited home gardens. Innovation and trade have led to many products being adapted in home gardens, some subsequently for cropping in larger fields.

Breeders of plants and livestock have for centuries selected lines for small-scale production; access to this diversity of genetic resources improves productivity and choices. Today, technology such as inexpensive polythene film can be used to improve growing conditions. Products and practices can be selected to suit changes in household needs and market opportunities. Agrochemicals have a place in agriculture, but organic production practices are favoured by the proximity of gardens to homes, community environmental concerns and opportunities to market safe, organic, fresh food available daily. As education and income levels rise in developing and developed countries, the demand for organic produce has risen[5]. This has also led to innovations in garden production and processing technology, and opened global markets for organic products.

Many people and communities face the need to diversify their livelihoods to adapt to local and regional trends and changes. Gardens provide opportunities for testing alternatives, learning to apply and adapt new technologies and processes, and getting to know specialized market requirements while keeping risks of diversification low. Entering a market with products to sell for the first time can be challenging. If the garden is located on a road or path, it may be easy to sell directly to people passing by. Testing the market can be as easy as offering products to people in the village or neighbourhood, local shops and restaurants, and learning from the feedback about price, quality, sizes, and the competing products.

[5] Haas, R., Canavari, M., Slee, B., Tong, C. & Anaruga, B. 2010. *Looking East Looking West: Organic and Quality Food Marketing in Asia and Europe*, Wageningen , the Netherlands

FIGURES 16 & 17 Innovation is part of gardening. Figure 16 Sun warms the rock of a high Himalayan garden, so plants grow faster; Figure 17 Pottery urns leak water slowly into garden soil
(Figure 16 Photo by C. Landon-Lane)
(Figure 17 Photo by A. Sthapit, ICIMOD)

Types of gardens

In urban or rural areas, a simple **kitchen garden** may be inexpensively established - a small plot from which vegetables and garnishes are taken each day to improve meals. Located at home, there is less risk of food losses from foraging wild animals and from theft. In the household farming system, most staple foods are usually supplied by one or more crop fields. Such fields are typically at a distance from the home, and a family member may have to stay there overnight in a makeshift hut in order to protect it at harvest times.

FIGURE 18 Home gardens can start as a very simple vegetable bed in the sand of a Pacific Island atoll
(Photo by C. Landon-Lane)

FIGURE 19 A multi-layer garden in Viet Nam resembles jungle forest with all the growing niches filled. Taro and sweet potato tubers in the ground, sweet bush (Sauropus androgynous) and chillies at knee-height, a few sugar cane, banana, fruit trees, and cucurbit squash and gourds climbing up a trellis allows light to plants below. A small pond keeps the environment cool, provides water and fish. Poultry range about, but temporary fences protect food plants at critical times
(Photo by C. Landon-Lane)

Requiring a little more space and capital invested, traditional mixed gardens (sometimes termed polyculture) integrate poultry, other livestock and fish ponds to provide productive opportunities for waste transformation and nutrient recycling. Multi-layer gardens maximize use of scarce space by cultivating crops in multiple layers – trees, vines, understorey and root crops.

Living space, boundaries and materials are traditionally integrated into gardens. Trees provide shade and shelter under their canopy and their roots stabilize soil. Multipurpose plants, such as sea buckthorn (*Hippophae rhamnoides L.*) in cold areas, *Leucaena glauca* in tropical areas and even cassava, are planted as living fences to provide crop protection, privacy, firewood, materials, food and animal fodder.

FIGURE 20 A living fence of cassava gives privacy as well as food from the roots and shoots. (Photo by C. Landon-Lane)

In parts of Asia, parents traditionally plant a neem tree (*Melia azadirach*) in their garden for every child born in their family, so that when they are adults there is timber for them to build their own house. The natural pesticide in neem seed oil is commercially manufactured and traded globally, providing income opportunity for seed growers and collectors. Made from what it grows, the traditional rugo in central Africa is a cluster of round thatched huts fenced by grasses, wood and crop terraces in concentric circles to control erosion and afford protection from wild animals. It is a home for the extended family and there are huts for livestock, food stores and even compost.

CASE STUDY 3 **Traditional gardens in different regions**

Observation and study of traditional gardens in various cultures and climates highlight some regional characteristics. Gardens are conservation sites of indigenous plant species - domesticated and semi-wild edible and useful plants - and reflect cultural preferences. It is interesting to note that in the current economic climate, home gardens tend to be most important for the poor and people vulnerable to food insecurity.
Asian gardens provide households with a number of benefits:

- Preservation of aesthetic and cultural values;
- Production for family nutrition, where energy yield in kCal/ha can be higher than the yield from rice paddy;
- The largest single source of household income in many cases;
- Income peaks in non-harvest seasons, when the garden serves as an income and food reserve.

In Indonesia, gardens are managed more intensely by poor farmers than by rich ones, contributing about 25 percent of their household income. They have high species diversity and typically function as a primary source of non-staple foods, a reserve supply of staple food and a source of income. Goats in stalls and hens provide protein and manure. In Nepal and Bhutan, spices and medicinal plants are important and wild vegetables regularly supplement home consumption. In Viet Nam and parts of the People's Republic of China, the vegetable-animal-fishpond garden relies on recycling residues; animal and human wastes manure the garden and pond, pond weed provides animal feed, plant residues feed fish, pond water is used for irrigation and pond mud is used for soil dressing. Pigs, ducks and other poultry are common livestock.

African gardens are multi-storied and diverse in humid areas, becoming less complex and diverse where rainfall declines and is less predictable. In very densely populated settlements, gardens are simpler and smaller - a few fruit trees and vegetables such as amaranth and okra. Increasing emphasis on cash crops in field agriculture has given the home garden a greater subsistence role; more staple foods such as sorghum, cassava, yams, groundnuts and oil crops are grown in African gardens than in Asia or Latin America. Compound livestock and tree gardens are especially important in the Sahel region where the rainfall is irregular; studies have shown that their returns are less risky than field agriculture. Gardens are a strategic insurance against total crop failure from drought or disease. In eastern Africa, an ancient association with tree gardens means they propagate themselves and require little or no care, giving rise to the term nonculture - an opposite concept to risky monoculture.

Latin American gardens evolved from a range of ethnic influences from pre-Colombian times and are still important for subsistence and income generation. The Mayans developed mixed perennial gardens in semi-dry areas, kitchen gardens among the indigenous peoples and floating gardens in swamplands. Gardening influences were brought to the Caribbean from Africa by slaves; gardens were an essential source of

CASE STUDY 3 **Traditional gardens in different regions** *(Cont.)*

food during slavery. Gardens typically contain root crops, spices, herbs, fruit, vegetables and ceremonial or ornamental plants. Studies on many islands suggest that gardens are increasingly used by poor people as a strategy against food inflation resulting from heavy reliance on imported food. In the Andes, where animals are the principal form of savings, women tend gardens and animals. Gardens are planted with crops such as potatoes, onions, garlic, tomatoes, chard, beans and maize for year-round consumption and sale. Guinea pigs and rabbits are efficient producers of protein in kitchen gardens. Gardens provide food during lean pre-harvest periods and supply seed for potatoes and grains.

Urban gardens have evolved rapidly with increasing urbanization. By 1996, the United Nations Development Programme (UNDP) estimated that about one-third of urban families worldwide produce almost one-third of the vegetables, eggs and meat consumed in cities. Urban gardens are found wherever the minimum gardening requirements are satisfied: near houses, on high rise apartment balconies, along drains and roads and in temporarily vacant lots. The poorest sectors of society are often the gardeners: recent refugees, migrants, elderly people and unemployed people. The proximity of buyers provides a good incentive and can stabilise livelihoods.

FIGURES 21 & 22 Urban micro-gardens in Venezuela. Figure 21 A kitchen garden saves money and the long walk to a market, so mother can give better care to home and young children. Figure 22 Stirring to aerate the water, this rooftop gardener can harvest a crop of lettuces in four weeks
(Photos: FAO/ http://www.fao.org/english/newsroom/field/Caracas_photo_gallery/Caracas1.htm)

Market gardens are larger, specialized, and are usually operated for commercial purposes. Most communities have enough people to allow viable specialization to meet market opportunities such as daily fresh vegetables, seasonal fruits, or flowers which have a fairly stable market demand in cities and even in small communities. Demand for fresh vegetables and flowers by urban markets gives peri-urban market gardens the advantage of short transport time, lower transport cost and lower post-harvest losses than those further out in rural areas. Poultry, eggs and other intensive or small livestock production may be integrated, making use of market garden waste.

Nurseries propagate and sell plants and trees for urban gardens, architectural landscaping, woodlots, and fruit and vegetable seedlings to meet local commercial and home garden demand. Floriculture, potted plants and ornamental plants are another specialized market-oriented garden system particularly suitable in peri-urban areas.

BOX 2 **Market gardens**

Market gardens are common in areas with good transport to markets and specialise in identified market opportunities. To meet demand on a regular basis, especially in the case of highly perishable salad vegetables or cut flowers, requires gardeners to stagger planting dates to ensure daily or weekly harvests, sometimes all year round. Labour requirements may be higher than other garden models, but opportunities for employment are increased in post-production and off-farm tasks such as cleaning and packing produce and deliveries to market.

Some market gardens focus on seasonal opportunities. For the festive period of the lunar new year, East Asian gardeners lop off blossom-laden branches of specially-pruned peach and cherry trees and sell orange fruited kumquat citrus trees in pots. Initial capital is required, but labour inputs are limited mainly to the pre-harvest and harvest period.

Market gardeners may specialise in seasonal crops such as high-value fruit or flowers. These tend to be for higher-income urban markets, so quality and distribution systems must be well organized.

BOX 3 **Nursery gardens**

Nursery gardens provide inputs such as trees or agricultural crop seedlings for other farming or community activities. These specialized gardens may serve off-farm markets or integrate overall farm operations. In temperate areas where winters are mild, such as parts of the People's Republic of China, Argentina and Western Europe, farmers can grow a range of winter vegetables in some of their grain fields. Cool temperatures slow the growth of these vegetables when they are young, making them vulnerable to loss from rodents or frost. To profit from seasonal needs, specialist home garden nurseries produce seedlings in pots, trays or as bare-root transplants.

Forestry needs, either for individual woodlots or for community forests, are often best supplied by home garden nurseries. Selected tree seedlings may require treatment to help them germinate - hot water for acacias, for example, and then a shady, moist and well-protected site for growing on, such as a corner of a well fenced home garden. Seedlings often grow better in potting mixtures containing home garden compost. Potting or packaging material such as banana or palm leaves is often grown in the garden.

FIGURES 23 & 24 Nurseries and floriculture. Figure 23 Tree seedlings grown in a nursery garden provide a community's woodlot in India. Figure 24 flowers from Solomon Islands floriculture gardens will be sold to homes, hotels and restaurants
(Figure 23 Photo by C. Landon-Lane) (Figure 24 Photo by A. MacGregor, Koko Siga Fiji Ltd)

Crops, livestock and fish in gardens

Garden crops integrate well with livestock and fish (see FAO Diversification booklet No. 13 *Farm ponds for water, fish and livelihoods*). Mirroring a diverse ecosystem, this kind of integrated farming system is traditional in low-lying areas of Southeast Asia and has been adopted elsewhere. In Viet Nam, the VAC garden (vegetables-fish-livestock garden), and in Indonesia, the surjan system has been developed and promoted extensively. To build a house above seasonal flood level, people dig soil out to make a raised house foundation. The hole dug out becomes a pond next to the house. The house has a garden (vegetables, fruit), small livestock (pigs, poultry, goats), and fish pond (snails, carp, catfish, tilapia), integrated in a circular system. The pond provides garden water and nutrient rich mud, the garden and home waste feeds the animals and fish, and animal manure feeds garden and fish. The synergy between these elements has given rise to names such as *permaculture* and *polyculture*.

Not all areas have the water available for aquaculture, but most areas can integrate gardens with livestock – the relation between the ubiquitous village chicken and its garden, and the night stall for goats and cows in the garden are examples of how easy the two complement each other.

FIGURES 25 & 26 Figure 25 A polyculture garden grows fruit, vegetables, rice, poultry and fish in Sumatra, Indonesia. Figure 26 A Cambodian garden provides a roof for the goat stall, benefiting from the animal manure.
(Photos by C. Landon-Lane)

FIGURE 27 Small livestock are easy to integrate into a garden, as they take up little space and can make use of garden and kitchen waste. Farmer tending sheep in his garden where date palms are growing
(Photo: FAO/ 21795/R.Messori)

Initiatives to increase benefits

Market appraisal

In choosing what market to supply, gardeners have to decide if they can meet market needs. Apart from the type of product and its quality, they need to consider how to get their product into the market and when to supply it; appropriate transport and supply processes are essential. More buyers may choose a product that either is already known or is promoted so that they are familiar with it.

Products for markets are of two kinds: sale of produce surplus from family food needs, and produce grown specifically for markets. Developing marketing strategies and procedures can be started on a small scale, and volumes increased once the systems for transport, packaging and sales are proven. Neighbours in a village and local community are markets that are often ignored, although they are easy to reach. With a more complex marketing chain using transport and other resources, a home or market gardener may aim to supply larger markets in nearby and more distant population centres. These markets require a more specialized garden system or a collective approach to provide sufficient quality, volume and shipment frequency.

Appraising a market means understanding the demand side and the supply side of the market. On the demand side - what products buyers want (for example the crop, variety, and how much is wanted), the quality (for example size, colour, and condition), and the service (for example delivery, divided into bunches or weighed lots, and packaging), and price. On the supply side, gardeners need to know they can produce what the market wants, at the right time or season, what others are doing, competition, and that a profit can be made. Produce grown for family subsistence may not be in demand by other families in a time of plenty. On the other hand, well stored products sold during a shortage period may earn good prices. If high quality products can be presented, buyers will buy at prices higher than those for lower-quality produce. Markets thus determine choices of crop or livestock that can be produced for sale.

FIGURE 28 Market choices. Information on what sells, prices and competition can be obtained from many sources, including local street vendors
(Photo by C. Landon-Lane)

Decisions on crop and animal types, production schedules, produce quality and organization of distribution are improved with better market information. Market information is a significant factor in improving home garden enterprises. Gardeners use four main kinds of information to help them fine tune production, post-harvest handling and marketing practices:

- The size of a market helps gardeners estimate how much they should produce and sell; this information includes the quantity or weight to be sold, the number of buyers and how much they buy.
- Information about the duration of demand for a product, for example, staple foods consumed year round or flowers for festive or holy days, is used to fine tune production scheduling, product storage and distribution systems.
- Information about the popular characteristics of a product that buyers prefer including size, shape, weight, colour, packaging and overall quality, enables gardeners to enjoy premium prices and loyal, regular buyers. Market information often includes the range of prices for different grades of product quality.

FIGURE 29 Women taking fruit from their home gardens to sell at the market (Photo: FAO/CFU000402/ R Faidutti)

- The location of the market requires gardeners to develop appropriate packing, handling and transport procedures.

The market potential of traditional and indigenous crops should not be overlooked. Indigenous vegetables and herbs can be better adapted to local conditions, have cultural significance, commercial potential and health benefits that can drive expansion of market demand[6] . The cultivation and consumption of these types of plants is common amongst ethnic minorities and women in rural and remote communities, and a number have become popular internationally. Besides the wide range of 'Asian' vegetables with growing market profiles such as flowering broccoli, mustard greens, and kinds of squash, newly recognized health and taste benefits of some indigenous garden plant products have lead to a large growth in international sales and garden plantings, such as Açái berries from Latin America, and Goji berries from the Himalayan mountains. Tourist visits to rural communities are popular; tourists like to observe

[6] Development of indigenous vegetables project. Vietnam Women's Union and the Australian Center of International Agricultural Research (ACIAR), Hanoi and Canberra, 2007-2011.

FIGURE 30 Developing the market. For a festival in Buli village, Bhutan, the local women's group organized a cooking competition based on using garden produce. Preparing home-grown meals and local competitions are a great way to promote new tastes of garden products (Photo by C. Landon-Lane)

traditional village industries, handicrafts and specializations such as cultivation of spices, medicinal plants, flowers and ornamental plants.

Garden products

Choosing what to grow from the wide range of potential products can seem difficult. Assessing the market gives an idea of what the market wants, but what suits the gardener may be different. Household resources, needs and preferences usually come first, later choices can be made of what and how much to grow. Choosing what to produce for a family and for sale needs to involve all family members. A home garden employs and feeds almost all family members, therefore women, men and the elderly should be involved together in decisions about a home garden. More produce is consumed by women and children, especially young children, from gardens controlled by women. Choices are best made considering the whole farming system, since garden products tend to complement other farm production.

Extra resources increase the options for improving production, but gardeners must assess what they have access to and what suits their situation. Time-consuming operations can be completed faster and more easily with machinery, which makes it possible to expand into a market garden. To mechanize operations, choices need to be made about power sources whether hand, pedal or engine power, and how to obtain access to them.

Available sources of energy need to be considered, such as solar energy for drying home-processed foods, or biogas captured from manure compost in a home garden to be used for cooking. Wind and water can be harnessed to power mills, water pumps and generators. Mechanization options depend on access to equipment, operator training services, spare parts and maintenance services. Access to financial resources such as savings, informal credit or bank loans and technical and commercial information increase potential options to develop home gardens.

FIGURE 31 Many products can be grown in a garden, including crops, livestock and processed and value added items for household use or sale. Starting with a wide range allows time to learn and decide if the gardener wants to specialize in one or more products (Photo by C. Landon-Lane)

FIGURE 32 Adding value at home. Using traditional cooking skills and home garden produce, an Indonesian woman earns an income from spiced cassava and vegetable cakes and dried vegetable slices.
(Photo by C. Landon-Lane)

Adding value

Viable gardens create opportunities for input suppliers, processors, small manufacturing, traders and other service providers, as well as generating income, much of which is spent in the community. Adding value to crops and livestock through storage and small-scale processing increases the livelihood options for rural households. Milk, feathers and fibre from poultry and livestock, for example, are commonly worked into saleable items by small-scale processes. Processing perishable products extends shelf-life, reduces losses in

transport and can enable a regular supply to be maintained for markets. Development of small businesses can multiply the employment and livelihood opportunities for rural communities. Micro-enterprises do grow into thriving businesses, often so specialized that their garden origins may no longer be recognizable (see FAO Diversification booklet No. 5 *Processing for prosperity*).

Many small-scale street vendors and food-stall holders can make a living for themselves and their families by processing or selling food (see FAO Diversification booklet No. 18 *Selling street and snack foods*). In Malaysia, for example, preparation and sale of street food employs more than 100 000 people and generates more than US$2.2 billion in sales annually. If product quality can be assured, street food provides adequate and inexpensive nourishment for many urban inhabitants.

TABLE 2 **Examples of how home gardeners add value**

Value-adding at home	Home garden products plus additional resources	Marketing strategy to add value and profit
Storage	Storehouse	Sell in shortage period
Kitchen-scale drying and preserving	Cooking utensils, preservatives-sugar and salt; containers - bottles and jars; drying equipment - baskets, trays and polythene film; a heat source	Maintain regular supply Use fresh surplus
Oil extraction, cheese making and other processing	Small press, cooking utensils	Maintain regular supply. Sell to distant market
Grading, sorting and packaging	Packaging materials and sorting area	Sell direct to retail markets
Ecological production method	Certifying agency, recognizable brand and sometimes facilitating legislation	Sell at a premium as certified organically grown product to discerning markets
Capitalize on agro-ethnic uniqueness or other interest factors	Link into tourist industry	Charge fees to tour operators Provide village guides Sell home produce and local souvenirs Provide food and accommodation

Value-adding can also be part of the garden services. Micro-businesses using links between gardens and tourism have been successful in situations as different as the mountains of Nepal[7] , the atolls of Maldives[8] and outer Fiji Islands[9] . Making a selling point of local products and traditional garden techniques involved in making food and non-food products is a cornerstone of the agrotourism approach. In Papua New Guinea, for example, an agrotourism offers visitors the chance to witness yam production and processing. Meanwhile, members of the South Sea Orchids (SSO) women's floriculture group in Fiji are growing orchids, anthuriums, gingers and heliconias for the hotel and export market.

Marketing

Following market trends and information helps to keep identifying opportunities for sales of fresh produce and outlets for sales of commodities and value-added products. Cash crops such as coffee or vanilla sell for better prices if they are properly processed and dried, which may be done by individual households or done on contract by someone who has the appropriate equipment. Gardeners learn how to exploit small-scale markets in their communities. Once farmers are familiar with these and generating some income, their gardens may evolve into smallholder enterprises supplying larger and more distant markets.

Serving customers is one of the most significant aspects of successful marketing. Successful small-scale enterprises meet market needs. In some countries, especially those in transition from a command economy to a free market, the successful people are those who find out what their customers want. Marketing new kinds of produce may require adaptation and promotion to expand local preferences; some customers may want to ensure that they can get a regular supply. Generally, the higher the income of buyers, the higher their demand for quality. To gain a share of more sophisticated markets, gardeners must supply better-quality produce, which will often come from high-quality varieties and improved livestock breeds.

[7] Kruk, E. 2010. *Upper Mustang Value Chain Project report*, ICIMOD, Kathmandu

[8] World Bank. 2010. *Priorities for Agriculture and Rural Development*, Washington DC.

[9] SPORE. 2010. *Agrotourism: Hospitality pays* No. 149, CTA

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To maintain supplies of produce that suits customers, garden enterprises need experience and knowledge of the chain of events from production and processing to distribution and sales. Vegetable growers ensure they can provide a regular supply by leaving a week or more between plantings. Processing markets for cash crops have specific requirements: some,

FIGURE 33 Service is a sales point. Selling from a shop on or near a market garden gives customers a clear link to where their food comes from, who grows it, and some idea of how it is grown. For the grower, a short marketing chain means less profit goes to middlemen; for the customer, it means the food is fresher. There is an increasing trend towards buying local food in cities worldwide.
(Photo: FAO/ http://www.fao.org/english/newsroom/field/Caracas_photo_gallery/Caracas1.htm)

FIGURE 34 Packaged for transport. A nursery in the Lao People's Democratic republic uses banana-leaf containers which rot away after planting
(Photo by C. Landon-Lane)

such as fruit processors, need to spread supply over long periods to maintain factory throughput. High-quality coffee processors need to have coffee cherries delivered to them on the day the cherries are harvested. Packaging and means of transport differ according to how, when and where the produce is wanted.

Nurseries produce plants either as bare-root plants or in pots or tubes. Bare-root plants are generally trees and shrubs for local planting in the cool season. Bare-root plants may be cheaper and more appropriate in certain situations such as farm woodlots, but potted plants are easier to transport and may arrive in better condition. This is especially important for nursery gardens serving intensive field agriculture, where farmers want bulk crop seedlings of uniform standard to give them a seasonal head start.

Market risk is part of the overall risk in any kind of agriculture. It is inherent in the choices made and may be reflected in high or seasonally fluctuating prices. Successful entrepreneurs find out seasonal and cyclical price trends to get an idea of the price profile of their product.

Enterprises may fail because of production risks such as crop losses and from changes in market conditions. Lower-than-expected prices can result from increased competition, exposure to lower-priced imports and changes in the cost of garden inputs. Competition may come from other producers and from similar products that can replace what a gardener is trying to sell. Successful entrepreneurs pay close attention to market information and respond early to threats. They budget inputs carefully to ensure profitability over a price range that reflects good and bad marketing conditions. The likelihood of damage and reduced product quality, either from ecological conditions such as bad weather, pests and diseases, or from failures in the harvesting and distribution chain such as roads being washed away and equipment breaking down has to be weighed up and mitigating measures taken in advance.

FIGURES 35 & 36 Figure 35 Good handling and transport in Viet Nam gets vegetables to a customer in top quality condition. Figure 36 Street vending in India takes time, but brings garden products right to consumers.
(Photos by C. Landon-Lane)

FIGURE 37 Stall holders at municipal vegetable and fruit markets in Nepal can turn over large quantities of a wide range of produce. Understanding what they want, when they want it, and negotiating a price they will pay is all part of marketing.
(Photos by C. Landon-Lane)

Organization

Home gardens are usually the simplest to organize and manage. Small in size, run by family labour, and the main market is the household. Home gardens can be organized into more complex systems with livestock, aquaculture, multiple layers of crops, and year-round production.

Bigger scale market gardens require more time and effort in management, not only of crops, but of the work to be done, planning, keeping up with inputs, harvesting and marketing. They can still be run as a family labour enterprise, but the key tasks must have people responsible for them, and those people must have appropriate skills. Key skills areas, all interrelated, needed are:

- Production: planning and obtaining inputs, cultivation, irrigation, crop and animal health, harvesting;
- Post-harvest: handling, quality grading, packing and transport to market;

- Marketing: identifying markets, market demands, customer relations, selling;
- Management: planning and organizing input materials, work tasks and workers, practices and procedures, supervising marketing;
- Managing the finances.

There are different forms of business enterprise organization, but planning and organization, even for a garden enterprise, is best based on a business plan. Key parts of a business plan are:

- Production plan: what is produced, where, and how;
- Marketing plan: what is to be sold, where, and how it will be sold;
- Management plan: who does the work, and how it is organized;
- Financial plan: the source and use of money in the business.

FIGURE 38 Organizing people as well as garden crops and land in different stages of production is essential to maintain steady supply to customers. In Viet Nam, garden beds in an organic garden greenhouse are planted and harvested one after the other each week. Plastic mulch prevents weeds and reflects light up to plant leaves to assist growth. Seedlings, compost, materials and people need to be carefully managed as the garden gets larger. (Photo by C. Landon-Lane)

A cooperative is a basic form of business structure owned by a number of people, for example a group of like-minded people, a community group, village or even a family clan. All members share in the costs and benefits of the cooperative. Labour is provided by members, financial costs for garden inputs are deducted from garden sales revenue, and benefits (both food products and income) are shared amongst members. The cooperative appoints a management committee to run the business. In the Chupulum garden cooperative in Caracas, Venezuela, for example, the vegetables not consumed by the cooperative members are sold in a farm shop next to the field. As soon as the field is fully cultivated, the members count on being able to support themselves by selling their produce.

FIGURE 39 An urban cooperative garden in downtown Caracas is run by a cooperative of seven members with no previous agricultural experience. They were trained by Cuban technicians, who were paid by the Venezuelan Government
(Photo: FAO/ http://www.fao.org/english/newsroom/field/Caracas_photo_gallery/Caracas1.htm)

Support services for garden development

Support services for all

Gardening, like any other livelihood activity, develops more fully with services to support their various activities, including:

- Skills and techniques that can be obtained from research, extension and training agencies, from other farmers, from garden and farm supply shops;
- Seeds, cuttings, and seedlings from nurseries or other gardeners;
- Seeds, fertilizers, other inputs and equipment from garden and farm supply shops;
- Packaging materials and transport services to send products to market;
- Marketing facilities, often established by municipal authorities with spaces leased to traders, gardeners and farmers;
- Market information, which may be provided by government or non-government agriculture agencies, or available from traders.

Better skills transfer and acquisition rapidly increases the variety of livelihood improvement options available to farming families. Government agricultural technicians are often the only public sector support services, but their reach to all, especially the poor and in remote areas, is usually constrained by limited funds. Alternatively, community workers of local authorities who provide community health and development services to women, elderly, youth and in poor areas, may also be trained to advise gardeners as part of their roles. Providing awareness and basic training in gardening to a wide range of community services helps gardening to develop and become self-sustaining within a community.

People with useful expertise and experience are to be found in most communities. They can often be utilized to meet training and skills requirements and other resources, either as individuals or as members of institutions such as farmer groups, women's groups or local government. Experience of home-garden development projects shows that selection and training of "master gardeners" as community

garden promoters is the best way to ensure viable gardens and retain indigenous knowledge in planning home garden improvements.

In some countries, there is public-sector support for small or medium enterprise development, which covers processing activities, trading and services. This kind of support facilitates commercialization by providing entrepreneurs with training in business planning, assistance in establishing group trading or processing contracts and support for accessing financial credit. Formal training opportunities for improved home gardening are typically limited by tight public sector budgets, but experienced local people, especially retired people, are important informal training resources. Technical information is available from agriculture departments and gardeners' groups. In ethnically diverse countries, pictures and graphics are used in technical posters and leaflets to overcome literacy constraints. There is good potential for taking advantage of this by establishing groups of home gardeners, cooperatives and similar organizations to exploit resources of information, technology and markets. Many countries already have specialised support networks such as gardeners' clubs or associations, fruit growers' or farmers' federations or unions that can provide training, supplies and access to model gardens. Community-development organizations and groups sponsored by communities or local governments, such as women's groups and social forestry groups, often provide facilitation.

All farming systems that produce output for sale need some physical inputs such as initial seeds and regular nutrients to replace those exported. These inputs must be bought and paid for in one way or another. Private traders and agricultural inputs supply shops are important sources of seeds, fertilizers, pest and disease control products, tools, equipment, and importantly, local advice. Gardeners can also employ a range of self-reliance strategies to avoid having to pay, including saving what they have and recycling wastes. To provide vegetable seed for later crops, some plants are left to flower and seed. Such "land race" seed may not provide the vigour or the market benefits of commercial hybrid seed, but the gardener does not have to spend

cash or rely on market access. Good gardeners select plants with the best production and market characteristics to be nurtured into strong seed, for which there may be a good local market if any surplus seed is produced.

The largest and most costly inputs in intensive agriculture are often fertilizers and feeds. Nitrogen-fixing plants such as beans and multipurpose trees are effective on-site resources of nutrients as a green manure, or as a component of animal feed. Utilizing unwanted resources was described earlier as an important design feature in the layout of improved gardens. Kitchen gardens can survive on waste water and organic household and farm wastes, which ideally are composted to provide nutrients for the garden and often for field crops. Many market gardens also make their own compost.

FIGURE 40 Funded through local authorities, a community worker advises 40 families with urban micro-gardens in Caracas, Venezuela
(Photo: FAO/ http://www.fao.org/english/newsroom/field/Caracas_photo_gallery/Caracas1.htm)

FIGURE 41 Private sector services and technical advice. Traders who specialise in garden supplies - seeds, fertilizers, disease control products and tools – are essential private sector support services. Support services can include advice on what and how to use items, and where to obtain items such as seeds and equipment, cultivation techniques, pest and disease control, marketing and even cooking
(Photo by C. Landon-Lane)

Development programmes

Home gardening programmes combined with nutrition education have proven to launch a chain of impacts that ultimately leads to improved food security. In a programme[10] sponsored by Helen Keller International in Bangladesh, less than three percent of participants dropped out of home food production projects annually, partly as a result of the positive impacts: year-round

[10] Iannotti, L., Cunningham, K. & Ruel, M. 2010. *Improving diet quality and micronutrient nutrition: Homestead food production in Bangladesh*, IFPRI Discussion Paper, International Food Policy Research Institute, Washington DC.

gardening increased from 3 percent to 33 percent; home vegetable production rose from 46 kg to 135 kg in three months; more than 60 000 rural jobs were created; and, over 70 percent of gardens were managed by women. Home food production not only increases the quantity of foods produced, but also improves the diets of vulnerable household members. Changing people's dietary patterns requires an understanding of the potential barriers to change and effective communications to promote food choices, child-feeding practices, and the beneficial ways of allocating food and other resources among household members.

The goal of the Asian Vegetable Research and Development Center (AVRDC) garden programme is to raise the productivity and quality of life of people in developing countries. The Center has designed school and home gardens using a variety of vegetable crop species to provide a year-round vegetable supply. Growing vegetables in school and home gardens is the most direct way for many urban and rural poor families to improve their access to a variety of micronutrient-rich food.

Garden programmes including animal production can greatly improve nutrition, but also add complexity to the programmes. For example, there need to be poultry breeders and the poultry require immunization and housing. Milking cows need good fodder and health treatments. In addition, animal production may increase the risk of zoonotic diseases (such as avian influenza), and may reduce the cost effectiveness of programmes by requiring more labour and capital. The lessons learned are to start small with simple kitchen gardens, then assist participants to lead programme development. This approach ensures both community and market influences are integrated into programme development.

Many local authorities, government agencies, NGO agencies, international donors and international financing institutions recognize gardening as a valuable and self-sustaining development tool to address poverty, malnutrition, food security and as part of community development. Proponents need to properly prepare garden programmes, tailored to local, national and donor development priorities, and with clearly identified target participants, to obtain funding.

CASE STUDY 4 **Gardening for livelihoods and food security: lessons learned by aid agencies**

The most successful gardening efforts in terms of food security and sustainability are those that have involved the health, nutrition, agriculture and micro-enterprise sectors in an integrated approach. Participation by NGOs and community organizations is equally important. To enable gardening projects to develop into effective regional efforts, governments should provide basic policy and other support services, for example, through research and extension, schools, health and nutrition promotion, and supportive land-use regulations.

The basic concept of gardening as a strategy for resolving poverty and the food crisis is the opposite of a relief food grant approach. It requires participation in the sense that people work for themselves - which they can do, provided they are not denied access to certain productive resources and advice or hampered by policy, for example, being forbidden to trellis beans from the balconies of state housing-project homes.

Development support agencies need to:

- Involve households and communities in design and planning of garden activities;
- Promote technologies and species appropriate for local needs and resources, which include cost, risk, labour requirements, cultural preferences, markets and compatibility with other farming-system components;
- Avoid narrow or imposed objectives such as improving vitamin A or other human micro-nutrition needs when families need gardens to supplement sources of energy, protein and income. Build on what is there already - existing production resources, support services and networks;
- Promote and develop resilience and a level of self-sufficiency in communities to buffer them against external shocks such as global food price crises.

Local authorities

Local authorities and government policies can assist or constrain garden potential. Land-use restrictions at the rural-urban interface or as part of state-owned land lease conditions can facilitate or limit certain production systems or choices of crops. Health policies may restrict gardeners' access to higher-priced markets, but should not prevent production for household consumption. For example, food safety regulations in some countries have previously required vegetables to be washed with a chlorine solution, but consumers did not want to eat vegetables with the residue, and growers did not want to use chlorine. Use of manures and compost manufacture can cause clashes with planning authorities and neighbours.

Success is more likely with a people-centred, interdisciplinary approach that develops and improves existing technologies. Indigenous production systems should not be

disrupted by "introduction of new and more efficient methods". Gardens, like smallholder farming, are part of social systems. It is best to develop home gardens that meet family needs and resources rather than the ideals of technical specialists in agriculture, health or land-use planning.

One of the most effective ways for local authorities to support growth of gardening is to allow groups to use vacant land – especially in towns or cities – both for growing areas and for marketing. In Caracas, Venezuela, for example, the mayor facilitated use of vacant land next to a railway bridge for a garden cooperative. Local authorities in many countries have allowed farmers' markets the temporary use of car parks, small streets, street and canal sides, and amenity parks. Traditionally, many urban communities enjoyed weekly farmers markets, on the specified day when local gardeners and farmers would bring their products to a designated part of town for sales. As a result of community interest and support of local authorities, they are again becoming popular. Key roles of local authorities are to provide and manage the space (possibly by delegating to a community group), provide access, provide health guidelines and inspections, ensure waste removal, and provide public liability insurance if necessary.

FIGURE 42 The mayor facilitates use of land. The Chupulun agriculture cooperative just outside Caracas, Venezuela, is next to a newly built railway bridge. The land is owned by a railway company but can be used by the agricultural cooperative through an agreement with the mayor
(Photo: FAO/http://www.fao.org/english/newsroom/field/Caracas_photo_gallery/Caracas1.htm)

Information systems

Government agricultural departments, municipal markets, and agricultural industry organizations usually have various systems and means for providing information on techniques, pest and disease controls, training and learning events, and market information. Market information includes what products are sold in the markets, prices, and how much is being traded. This kind of information system is useful for market gardeners to help them decide when to harvest and send produce to markets. However, good communication systems are essential: these can be as simple as a community notice board, local community radio, newspapers, or as complex as a searchable internet website; they may also be through people such as agricultural extension workers and non-government community mobilizers.

Commercial traders and retailers of farm and garden supplies are a valuable source of practical information on what to use and how to use the items they sell, and they collect and pass on experience from the gardeners who frequent their shops.

FIGURE 43 Finding information. Growers, traders, and agricultural extension workers are good sources of information, and willing to trade both knowledge and garden produce. Mobile telephones now have wide coverage and are an excellent way to get market and technical information quickly
(Photo by C. Landon-Lane)

Training

Acquisition of gardening skills is often not difficult with gardens, because they are close to homes in the community, relatively small in scale, potentially viable with small investment and suitable for a wide range of people. Typical community or village social interaction means that crop and animal technologies and business management skills and concepts can be readily exchanged. Seeds, cuttings, poultry hatchlings and fish fingerlings are readily and cheaply traded; novices can learn integrated cultivation and husbandry practices from what is achieved in established home gardens.

Compared to conventional training, farmer participation offers greater opportunity for social learning, which contributes greatly to generating innovation. Farmer Field Schools (FFSs) for Integrated Pest Management (IPM)[11] vegetable gardens, for example, provides farmers with the confidence to work together on low-cost sustainable gardening practices.

[11] For further information see FAO's IPM and community IPM programmes, www.vegetableipmasia.org, www.communityipm.org ,

FIGURE 44 Training on how to cultivate vegetables
(Photo: FAO/22110/J.Koelen)

Gardening has been successfully introduced into many school curricula worldwide, in both developing and developed countries. Training in gardening and agriculture provides not only a range of vocational skills, but also elementary business skills. Learning objectives can be given real life through a school garden, for example in mathematics and bookkeeping (garden planning and operation), science (biology, chemistry, physics and environmental science), health and well-being (nutrition, cooking, exercise, and team work).

FIGURE 45 Learning together. At Maria Taberoa Elementary School, Caracas, children, teachers and parents have learnt gardening together. A range of learning objectives are given reality through a garden
(Photo: FAO/ http://www.fao.org/english/newsroom/field/Caracas_photo_gallery/Caracas1.htm)

Challenges

- ***Hygiene, sanitation, safety and quality***

Producing a livelihood from local soil and water for high quality market requires local sanitation and pollution controls, and gardeners to pay proper attention to garden hygiene, and practices for food safety. These are basic essentials for quality garden food products that will sell for competitive prices.

Intensive agriculture such as market gardens and the advent of agro-chemicals without adequate advice and training, have led many farmers to use methods that are not part of their familiar local knowledge. This has resulted in cases of poisoning from pesticide residues, toxic nitrate levels in groundwater and the erosion of soil fertility that has made gardening impossible, particularly in peri-urban areas. Population and industrial development add to the environmental and health impacts.

Food safety can be a chronic health issue in locations where infrastructure for sewage and urban waste is not well developed, for example urban poor informal settlements or remote rural communities. If located carefully and managed with good agricultural practices (GAP) for food safety, peri-urban, urban and rural area gardens provide safe food.

FIGURE 46 Safe food starts at the garden. Cleaning garden produce in safe water is an essential practice to ensure products stay fresh, look good, and are free from potentially disease-causing bacteria.
(Photo: FAO/ http://www.fao.org/english/newsroom/field/Caracas_photo_gallery/Caracas1.htm)

FIGURES 47 & 48 Safe water. Figure 47 For washing garden vegetables prior to marketing, the side of a well must be raised to prevent dirty water running into the well. Figure 48 Runoff contaminates a well with manure and soil, but the water can still be used to water plants. (Photos by C. Landon-Lane)

TABLE 3 **Safe food from gardens – typical hazards, their impact, and control measures**

Type of food safety hazard	Sources of hazard (Where does it come from?)	Frequency of an incident (How often does it occur?)	Severity of an incident (How serious is the health impact?)	Example control and prevention measures
Biological hazard (e.g. cholera, typhoid)	• Irrigation water • Manure • Sewage • Washing water	Common	• High • Can be fatal	• Safe water • Composting or biogas plant • Good Agricultural Practices
Chemical hazard (e.g. pesticides, nitrates, toxins, heavy metals)	• Excessive pesticide • Fertilizer • Industrial pollution • Water	Medium	• High • Long-term accumulation can be fatal	• Good Agricultural Practices • Safe location • Safe water • Buffer zone around garden
Physical hazard (e.g. stones, shells, hair, glass, plastic, metal, paint flakes)	• Soil • Non-food plant or animal materials • Rubbish • Compost from urban waste • Faulty packaging • Debris from old facilities	Common	• Low • Mostly a quality issue	• Wash products • Good Agricultural Practices • Use appropriate packaging to reach markets • Clean and maintain packing areas

FIGURE 49 Garden composting and biogas composting.
(Photo by C. Landon-Lane)

Animal manure is a valuable resource in developed and developing countries. Environmental impact increases as garden enterprise levels become more intense. Waste management is an important concern in densely populated areas. Where local environmental laws and government practices allow, gardeners can make a positive contribution through composting, recycling and animal feeding, providing an end use for wastes.

Composting turns household livestock and human waste into valuable resources. Proper composting requires internal heat of 550 °C for at least 72 hours (3 days) to kill pathogens. Safe treatment of sewage effluent is a major concern in poor communities and rapidly growing towns and cities. Inexpensive biogas systems in the

People's Republic of China, Viet Nam, Bangladesh and elsewhere provide gas for home cooking, heating and small enterprise energy.

Treatment through aquaculture ponds in north-east Thailand has considerably increased farm incomes, for example. Ponds are a source of irrigation water; farm wastes feed fish such as carp or catfish and blue-green algae. The algae and pond mud can be used as fertilizer (see FAO Diversification booklet No. 13 *Farm ponds for water, fish and livelihoods*).

Planners need to be aware of how problems can be turned into opportunities. In dry areas such as Yemen and in remote communities in central Australia, effluent ponds have nurtured date and banana gardens for generations.

Transition from home to market gardens

Once a good understanding of gardening is established, households can start on improvements for family nutrition or market requirements. Improvements may introduce a wider diversity of plants, animals and fish, more effective management practices, or opening up new garden space.

Increasing garden space usually involves one or more of the following: replacing plants, increasing planting density, introducing new components such as livestock or increasing external inputs, especially water and nutrients, obtaining more land – maybe diversifying crop land. Multiple cropping and multilayer systems utilise existing light and space; examples are beans or pumpkins together with maize or sorghum, climbing vines on canopy trees or root crops beneath fruit trees. Replacement is possible where traditional gardens contain crops that have outlived demand. In areas where steel roofing has taken over from thatched roofs, for example, it makes sense to replace old thatching palm grown as a cash crop for higher-value crops.

Improving the layout aims to make efficient use of social and biological elements, structures, land forms, water and other materials. One of the first concerns is security, especially against wandering poultry and livestock. Many successful gardens make maximum use of local materials and resources. Living fences strengthen garden fencing; many, such as the multipurpose tree *Gliricida sepium*, also yield leaves for animal fodder and firewood.

Livestock, when controlled or selectively excluded from plant production areas, will clear crop residues, turning them into manure and

meat; poultry eat weed seedlings and insects among tolerant crops. Flowers and other plants may enhance the social functions of a home garden and play a role as bio-filters in reducing pests, such as marigolds and neem. Low-lying areas and steeply sloping land may be unsuitable for field agriculture, but may be developed into a sustainable garden using small-scale land-forming techniques such as raised beds, terraces and hedgerows. Post-harvest waste can be a valuable resource, especially for livestock and compost, and recycling water is also valuable.

The vast majority of gardeners worldwide use only hand tools. Typical gardeners have tools such as hoes or spades for soil preparation, rakes, forks, baskets and barrows for handling materials and sometimes dibbling sticks for planting seed. A range of equipment, depending on resources available, is used in developing countries to assist production and processing operations carried out in home gardens. Examples of more advanced equipment are listed below:

- Polythene-film traps warm air around tender plants and allows vegetables to be grown in the off-season. In the high Himalaya and high latitude countries such as Mongolia, for example, gardeners grow pumpkin using plastic cloches to prevent snow damage in spring. In tropical areas, shade cloths protect young seedlings from heat stress. Where space is limited, nets and plastic film are used as fences to keep out village poultry and field rats, and they do not compete with plants for light, water and nutrients.
- Small water pumps and lifting devices reduce time and energy in irrigation.
- Motor tillers primarily used in other components of the farming system are sometimes used for soil preparation and transport.
- Cleaning or hulling equipment for maize or coffee, for example, can be manual or electric. Small dryers for grain, fruit and vegetables utilize solar energy, firewood or electricity. Milling equipment is a favourite amongst women to replace the daily chore of pounding grain.

Scaling up from home garden to market garden requires management skills, access to resources, and attention to marketing. Strategies for transition into market gardens are to:

- Increase the size of the garden area to produce greater volume of products;

- Specialize into a few crops with proven market demand, based on becoming more efficient;
- Widen the range of crops, to provide more of what a market wants;
- Extend the production season, using techniques such as greenhouses.

Each of these strategies poses challenges, but with careful management of available work time and special care with debt, many small gardens have grown into successful businesses.

The need to organize people to have sufficient labour and the right skills at the right time, grows as the garden business scales up. Successful small-scale entrepreneurs need to take care that their input supply system is reliable and efficient. Animal breeders need to ensure access to feed, veterinary services

FIGURE 50 Specialized products, good quality. An Indonesian woman specializes in culinary herbs for an urban market. To keep the herbs clean, unblemished and of high quality, she grows them on a raised bamboo bench. The next technological step may be a greenhouse
(Photo by C. Landon-Lane)

FIGURE 51 Street marketing is an inexpensive and direct way to start selling to consumers, but without facilities the hygiene is not good enough for food safety, and local authorities are left with the waste. Hiring space in formal markets established by municipal authorities or community groups is a better strategy.
(Photo by C. Landon-Lane)

and products. Seed and other propagation material may be available through traders, shops or by seasonal collection from other farmers. Mushroom growers, for example, need stable supplies of straw, sawdust or other growth substrates.

Scaling up income-generating activities possible for individuals or groups of garden enterprises are dependent on energy, as well as nutrients and other inputs. Resources may already be available in communities, such as biomass from crop production or processing residues, or firewood grown on-site in a living garden fence. Renewable energy technologies allow garden enterprises a degree of independence; they are often the most appropriate technologies for smallholders. Water pumps, for example, can be powered by gravity using a hydraulic ram or by wind, people, livestock or petroleum fuels.

Access to appropriate transport is a critical resource for viable garden enterprises for receiving inputs and taking produce to be sold in distant markets. Where roads or tracks are rough or for foot traffic only, it may

not be possible to sell fresh produce in distant markets; non-perishable items or local processing is favoured by successful entrepreneurs. Where roads are reasonable, baskets of produce can be taken to market by local bus, in hand carts or horse carts, on motorcycles or by local taxi. Alternatively, gardeners take advantage of visiting traders coming to buy or sell field crops or cash crops. Once a village is known for its good garden produce, traders often follow.

Increased gardening can have negative social implications, from environmental changes brought about by the increased intensity of home gardening to changes in the household. Control of gardens is an important incentive, especially control of income from sale of garden produce. In some areas of Africa, men have taken over management and marketing choices as gardens managed by women have become more profitable, which not only decreases cash incentives for women but may also decrease the nutritional value of a garden.

Establishing a garden requires labour and resources, sometimes including capital. In the rural environment of developing countries, many household needs compete for cash and other resources. Garden systems should be developed that minimize risks. It is essential to ensure that gardens are sustainable. Gardens that rely on externally-supplied inputs such as seeds or greenhouse polythene may fail if gardeners are not trained to save their own seeds, or if external support for access to input supply markets is withdrawn.

Sustainability of resource management

Climate, local food preferences and trade influence regional differences in gardens. The naturally high biodiversity of certain tropical regions, combined with long exposure to trade routes, has led to high diversity of plants and animals and the existence of fish ponds in many gardens. In Java, Indonesia and Kandy, Sri Lanka, for example, traditional gardens - loosely managed, multilayer agro-forestry gardens- use ten or more different species to produce food from below ground upwards: root crops, leaf vegetables, climbing vines, low trees and emerging canopy trees. These highly productive, diverse gardens are common where competition for land is high. Such diversity of fresh food and the resilience it provides against climatic and economic shocks disappears when changes in

economic policy, employment patterns and increasing population affect traditional land use. Policy to protect and promote agricultural diversity is essential to meet the challenges of population growth and climate change.

In parts of the People's Republic of China, the pressures of high population and limited availability of land and nutrient resources have forced innovation and intensity in closely managed gardening systems. In some cases, ten crops can be harvested from a garden bed in one year. Despite this intensity, gardeners have used organic practices so effectively that fields near Chengdu (the People's Republic of China), cultivated during the Han dynasty, for example are still fertile after 20 centuries of continuous use. Meanwhile in Gansu and other provinces in China's northern wheat belt, burning of crop stubble to heat homes of poor farmers has led to desertification, loss of fertility until there is no response to additional chemical fertilizer. Various standards for good agricultural practices (GAP), such as GlobalGAP and certified organic[12] , do not allow burning of crop residue so that it returns to maintain the organic matter in the soil. Promotion and adoption of GAP is essential for sustainability, but so also are policy and investment to provide sustainable energy and alternative livelihoods to poor semi-subsistence farmers. Schemes to convert household and livestock sewage into biogas and compost have achieved some success.

By 2025, more than half the world's population will live in cities[13]. Government and local authorities must meet the challenge to sustain natural resources for gardens through appropriate and effective planning. Appropriate land use planning can facilitate retention of zones for gardens safe from urban or industrial pollution or contamination to soil, water and air. Planning municipal infrastructure such as transport, water, residential areas, and agribusiness and marketing zones to include gardens will improve economic efficiency in the garden-to-plate food chain, helping keep food prices affordable. For example, the Kigali Conceptual Master Plan is a long-term sustainable planning framework for Rwanda's capital. The Plan envisions a city set amid greenbelts and zones reserved for urban agriculture, open spaces and community gardens[14].

[12] See for example www.globalgap.org and www.ifoam.org.

[13] FAO.2010. *Growing greener cities*, Rome

[14] FAO.2010. *Growing greener cities*, Rome

FIGURE 52 Keeping the land productive. Gardening on sloping land in tropical climates can lead to erosion of fertile topsoil and cause the land to rapidly become unproductive. Sloping land agricultural techniques (SALT) in the Philippines use pineapple, maize, beans, vegetables, banana, coconut and fruit trees planted along contours to protect the soil.
(Photo by C. Landon-Lane)

FIGURE 53 City gardening is not new. The Incas' ancient citadel of Machu Picchu in Peru built about 600 years ago included intensively farmed terraces.
(Photos by C. Landon-Lane)

FIGURE 54 City gardening is not new. The modern roof garden in Tokyo, Japan, offers climate control and stress relief (Photos by C. Landon-Lane)

Spreading successful innovations in urban architectural design integrating rooftop gardens, micro-gardens, and 'greening' of residential buildings allow use of urban natural resources for residents to benefit from gardens. In Canada, for example, rooftop gardens have been an accepted element of urban buildings for a decade[15], and architects in other cities have also made them reality.

[15] Oberlander, C., Whitelaw, E. & Matsuzaki E. 2001. *Introductory Manual for Greening Roofs for Public Works and Government Services Canada,* Public Works and Government Services Canada.

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Sources of further information and support

Asian Vegetable Research and Development Center (AVRDC) is an international bureau with a mandate to work on vegetable crops, including vegetable legumes. The centre's Africa Regional Program (AVRDC-ARP) in Arusha, United Republic of Tanzania, extends AVRDC's mission into the African continent. AVRDC is working towards developing technologies to break the cycle of continuing poverty from generation to generation and reduce malnutrition problems through efforts in crop research and the application of vegetable gardening strategies. Improvements in vegetable production are making vegetables more affordable to families.
www.AVRDC.org

CRS (*www.crs.org*), **CARE** (*www.care.org*), **World Vision** (*www.worldvision.com.au, www.wvi.org*) and other non-government organizations have resource materials and provide services in many countries in support of garden initiatives for food, income and community development.

Food and Agriculture Organization of the United Nations (FAO) has a variety of support sources and publications including for gardens, small livestock, aquaculture, food and nutrition, school gardening, food processing and marketing. FAO has designed, implemented and evaluated lessons learned from home garden, market garden and school garden projects in Asia, Africa, Latin America and Europe.

FAO School gardens website
http://www.fao.org/schoolgarden/
Greener Cities
http://www.fao.org/ag/agp/greenercities/en/whyuph/index.html

Helen Keller International (HKI), a non-governmental organization that combats malnutrition and blindness around the world. HKI has for many years promoted and developed food-based, self-reliance strategies such as gardening for communities to reduce malnutrition especially in Africa and South Asia.
www.hki.org .

The International Federation of Organic Agriculture Movements (IFOAM) (*www.ifoam.org*), **the International Association of Organic Agriculture Research Institutes (FiBL)** (*www.fibl.org*) based in Frankfurt, and organic certification agencies such as **Biological Farmers Australia Ltd.** (*www.bfa.com*) based in Brisbane, provide services for organic and food safety certification, advice and training, and have publications ranging over organic soil management, plant production, school gardens, organic animal health and breeding, organic food processing, product development and marketing, and in comprehensive analysis of the organic market and in processing and production trends. IFOAM has supported organic gardening globally; FiBL in Eastern Europe, India, Latin America and Africa; and BFA mostly in the Pacific and Asia.

The Consultative Group on International Agriculture Research (CGIAR) offers technical publications from different disciplines. Relevant specialist institutions include the **International Centre for Research in Agroforestry (ICRAF)** in Kenya, the **International Centre for Living Aquatic Resource Management (ICLARM)** in Malaysia, the **Centro International de Agricultura Technica (CIAT)** in Colombia and the **International Rice Research Institute (IRRI)** in the Philippines.
www.cgiar.org.

The International Institute for Rural Reconstruction, Cavite, Philippines offers training, research and publications.
www.IIRR.org.

The Intermediate Technology Development Group in the United Kingdom offers training and publications, especially designs and illustrations of tools and equipment appropriate for manufacture and use in smallholder farming systems.

www.itdg.org

www.itdgpublishing.org.uk.

Notes

Gardens have been kept by rural and urban people for millennia thus providing them with food, income and concrete opportunities to improve their livelihoods. Policy-makers, donors and other development specialists need to realise the great potential and opportunities that gardens can provide to people the world over. The intent of this booklet is to raise awareness and provide information on gardens and how these can effectively and efficiently contribute to sustainable livelihoods.

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