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Drylands Gardening



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TABLE OF CONTENTS

[Dryland household gardens in development](#)

by Daniela Soleri and David A. Cleveland

Explores the potential of gardens to contribute to dryland development by improving individual and community well-being in ways that are socially, economically, and environmentally sustainable.

Sidebar:

[Techniques for dryland gardens: Water conservation](#)

by Daniela Soleri and David A. Cleveland

This short excerpt from the authors' book *Food from dryland gardens* draws on both western science and traditional knowledge in summarizing water conservation techniques.

[Hopi gardens](#)

by Daniela Soleri

Through a combination of tradition and innovation, Hopi Native American gardeners have developed strategies to cope with some common dryland garden problems.

[Impact of a women's garden project on nutrition and income in Senegal](#)

by Jacqueline Reynaud, Thierry Brun, and Tonia Marek

Measures the extent to which a household garden project has had an impact on nutrition and income in the project area.

[Household vegetable gardens in Africa](#)

by Timothy R. Frankenberger, M. Priscilla Stone, and Sandra Saenz de Tejada

Case studies from Mauritania and Lesotho provide insights into considerations that should be taken into account when implementing household gardens in development projects.

[About this newsletter:](#)

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- Credits

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[Dryland Gardening](#)

Dryland household gardens in development

by Daniela Soleri and David A. Cleveland

"Traditional gardens emphasize local self-reliance and environmental sustainability through the use of local knowledge and resources. "

- [Models for household gardens in development](#)
- [Potential contributions of dryland gardens to development](#)
- [Conclusions](#)
- [Author information](#)

Household food gardens have been a part of human subsistence strategies since the Neolithic. They have played an important role in the domestication of plants and continue to be an avenue for the introduction and adaptation of new crops.

Support for household gardens as a development strategy has come and gone over recent years. In this article we explore the potential of gardens to make a contribution to dryland development by improving individual and community well-being in ways that are socially, economically and environmentally sustainable, and are based on local control and broad participation. Household gardens are a supplementary food production system under the management and control of household members. In addition to food, gardens may provide herbs, fuel, medicine, fodder, building materials, shade, social or recreational space, and beautification. A household garden can be consumption or market oriented, but at least some of the produce will be consumed directly by the household.

In arid areas, and in the dry season of semiarid and some subhumid areas, garden location and form are influenced by the availability of water. In savanna Africa this often means location in river valleys where retreating floodwaters provide residual soil moisture, along dry streambeds where hand-dug wells can be used to supply water, or below dams, where individual household plots are contiguous. In Egypt and Pakistan for example, gardens are not usually present near houses, because of lack of space and irrigation water, but may be spread out along canals, planted as tiny plots in larger fields, or even interplanted with field crops. In other areas such as northern Mexico or West Africa small gardens may be near houses where they can benefit from recycled water.

Models for household gardens in development

[\(Back to top\)](#)

There appear to be two major models for household gardens in development which reflect two schools of thought or value systems in development. Awareness of the similarities and differences of these models is helpful for

understanding the role of household gardens in development.

Industrial Gardens. Industrialized agriculture typical of northern temperate regions such as the United States is large-scale, capital-intensive and aims to create optimal growing conditions for monocropping commercial crop varieties using agrochemicals for pest, disease, weed and soil management, mechanization, and centralized irrigation systems.

The production successes of industrial agriculture have made it a powerful cultural model worldwide, and traditional agriculture is often viewed as inferior. In combination with temperate-region row gardens, industrial agriculture has had a strong influence on the kind of gardens promoted by industrialized nations and extension workers trained in this tradition. The goal is often increasing production or sales, with inadequate attention to the effect on household economics, nutrition, or social well-being. Garden projects often overlook local gardening practices, promoting commercial seed of temperate European vegetables, European-style tools, and manufactured agrochemicals. Purchased inputs may be subsidized by the government or sponsoring agency and orientation is often toward local, national, or even international markets. However, industrial agriculture has not been an unmitigated success, and there is mounting criticism of its adverse effects on the environment, on consumer health, and on the poor in the Third World.

Traditional Gardens. Traditional gardens exist in most parts of the Third World, but are seldom studied, in part because of their genetic, agronomic, and sociocultural complexity. These gardens are one component of traditional food production systems, and share many basic characteristics with small-scale traditional agriculture. In addition to food, they provide many other products as well as a place for relaxation and social activities. Key features are the use of local knowledge and resources; locally adapted, genetically diverse crops with many varieties; crop rotation; mixed cropping; and the exploitation of different microenvironments, such as pockets of soil that hold water longer. Cultivated areas often resemble natural ecosystems, containing dozens or sometimes more than one hundred domesticated and nondomesticated species. These features minimize pest, disease, and weed problems. When they occur, these problems are managed by system adjustments rather than dangerous, toxic chemicals, as in industrial gardens and agriculture.

Cropping patterns and use of locally produced organic matter improve the fertility and structure of dryland soils. Management strategies, garden layout, and the use of simple physical barriers such as contour bunds and terraces help avoid soil loss due to erosion. Efficient water management is accomplished by concentrating water in a small but highly managed and productive garden area to make the most of this scarce dryland resource.

Traditional gardens may combine planting in rows or in raised or sunken beds, with mixtures of trees, vines, living fences, annual vegetables and herbs, and a variety of animals. In Durango, Mexico, peach, pomegranate,

apple, fig and citrus trees, and Indian fig cactus dominate household gardens. Herbaceous annuals - providing food, medicine, and flowers - are intermixed with the perennials. In savanna West Africa during the rainy season we have seen okra, amaranth, and other vegetables being grown by women in small garden plots next to the houses, with vines such as luffa and pumpkin growing over rooftops. Also in the area around the house are trees like neem, dawadawa, Borassus palm, citrus, and baobab which produce fruit and other products. These gardens spread out from the house into the permanently cultivated millet and sorghum fields where sesame, roselle, kenaf, and other crops are grown along pathways, and cowpeas and cucurbits are interplanted with cereals.

Gardens in development that are based on the traditional model have the goal of improving household well-being through the use of local knowledge and resources, without the need for credit for major capital investments. Thus they increase local self-reliance and help conserve valuable soil, water, and crop genetic resources.

While elements of both traditional and industrial approaches may blend easily within the confines of a single garden, distinguishing between them is useful because they are based on different assumptions about the role of gardens. In the following discussion of the potential contribution of dryland household gardens to development we will emphasize the differences between industrial and traditional gardens where relevant.

Potential contributions of dryland gardens to development

[\(Back to top\)](#)

There is evidence that gardens can support development efforts by improving household food production, nutritional status, and income. Where information about dryland gardens is lacking we have had to rely upon data from more humid areas.

Production. Many of the productive benefits of household gardens result from their small scale, diversity, and careful management. This is especially true of traditional gardens. Factors of production including time, energy, money, and land are only available to many low-income households in small increments. Accumulation of those factors for making larger investments is difficult for these households, but they can be used in gardens. Garden labor requirements, for example, can be met with small amounts of the spare time of men, women, children, the disabled, and the elderly, and gardening can easily be combined with child care and domestic tasks.

Reducing risk is essential for households with limited resources. Traditional gardens are a low-risk investment with dependable production because they use few outside resources and because the great variety of crops grown supports yield stability.

Household garden yields can be high. A study in eastern Nigeria showed that dry weight yields from "compound" gardens were twice as large as those

from more extensively cultivated outer fields. However, unlike field crop production, intensive garden, production may not mean lower labor productivity. In traditional mixed gardens, returns to labor may actually increase because of greater biological diversity, continuous harvesting, and a large proportion of perennials. Continual harvesting may raise annual yields and encourage fine tuning of management strategies. The above-mentioned mixed compound gardens in eastern Nigeria yielded returns to labor that were four to eight times greater than those in outer fields. A study of two household gardens in an urban desert environment in Arizona, U.S.A., showed yields between 1.2 and 6.5 kg/m². These results can be compared with commercial vegetable production in that country which yielded on average 1.7 kg/m² in 1974. Returns to labor from less than 1 to almost 16 kg/hr are much lower than in large-scale, commercial agriculture, but this comparison is deceptive. The high labor productivity in large, mechanized fields is bought with large amounts of expensive, nonrenewable energy in the form of pesticides, fertilizers, electricity, and fuel. For this reason their production efficiency is debatable at a time when the serious implications of environmental degradation are being recognized.

Nutritional Status. Malnutrition is a major problem in Third World drylands, especially for low-resource households. Seasonal variations in rainfall affect food production, people's work loads and disease problems, thus having a direct effect on nutrition and health.

The nutritional impact of garden projects has seldom been measured, partly because it is so difficult to do. The influence of gardens on the nutritional status of household members is affected by many factors including quantity and quality of garden nutrient production, availability of nutrients in garden produce, storage and processing, food distribution, and diet. However, dryland gardens have the potential to address three of the most important dryland nutritional problems: protein/energy undernutrition of infants and children, vitamin A deficiency, and anemia resulting from lack of iron and vitamin C.

Many dryland garden crops are excellent sources of vitamins, minerals, and dietary fiber. Less well-known is their potential to supply important amounts of protein. For example, the dark green leaves of jute (*Corchorus olitorius*), cowpea (*Vigna unguiculata*), and pumpkin (*Curcubita pepo*), widely eaten in Third World drylands, are only 4 percent or more protein by weight when fresh, but are 20 percent to 35 percent protein when dried. While dryland gardens will not be the main source of energy and protein, they may supply these nutrients in convenient forms and at times of the year when major sources are unavailable. This is especially important for weaning children, the most nutritionally at-risk group in the population.

Theoretically, an important characteristic of gardens is that they facilitate the continual consumption of small amounts of a variety of nutrients which complement the rest of the diet. In addition, eating fresh produce from the garden soon after harvesting avoids the post-harvest nutrient losses that occur due to storage, handling, exposure, and processing.

There is little research on nutrient production in traditional Third World gardens, but data from other types of gardens is available. Research on two urban desert gardens in Arizona, U.S.A., (77.4 and 58.3 m²) recorded a year-round harvest that provided the gardeners with significant proportions of the RDAs for ten nutrients, including over 50 percent of the RDA for vitamins A and C for more than half the months of the year, while only two to three hours per week were spent gardening. Perhaps the most ambitious study to date was of experimental gardens in the humid tropics by the Asian Vegetable Research and Development Center (AVRDC) in Taiwan. Results from the third year of the study (1983-84) showed yearly production of RDAs for a family of five determined quarterly on samples from the gardens as follows: 13-18 percent protein, 33-42 percent calcium, 56-82 percent iron, 82-125 percent vitamin A, and 336-374 percent vitamin C.

Gardens can affect diets directly by providing nutritious foods that are too expensive to purchase. Or gardens can contribute both directly and indirectly, as a source of income, to improved child nutrition, as has been documented in southern India.

In addition to agronomic and culinary factors, the nutritional impact of gardens also depends on complex social and cultural patterns that determine food distribution within the household. Gardens that produce more household food may lead to more reaching those last in line. When women control the garden and its produce, household food distribution may also change for the better nutrition of children, especially during weaning.

Education can have an important influence on the nutritional impact of household gardens. A garden project in Ilesha State, Nigeria, in the late 1960s emphasized traditional crops and gardens and included a strong nutritional education component directed at local women. This project is said to have reduced child death due to malnutrition among gardening households from 10 percent to 6 percent in three years. But results are not always positive. Research on the nutritional impact of a garden project 20 years after its initiation in western Senegal shows no improvements among participating households (see related article on Senegal). The researchers believe this is due to lack of nutritional education and because most of the produce was being sold with only 7 percent of that income used directly for food purchases.

Obviously there are many links between establishing a garden and improved nutrition, and problems can occur in any one of them which will diminish the nutritional importance of the garden.

Income. Another common goal in garden projects is increasing household income. Cash incomes of many in the Third World are so low that even small amounts of savings or income from the sale of garden produce can play an important role in improving household well-being.

Starting small minimizes the risk of marketing garden produce. The smaller the investments of time, labor, money, and water the smaller the gardener's

losses if there are problems. Another way to reduce risks is to grow only market crops that the household can use if for some reason they are not sold.

In some cases markets may be influenced by upper income and foreign tastes. In a project in southern Senegal an important reason for the success of communally organized women's gardens was that they responded to the demand for fresh produce of hotels serving a booming tourist trade. While some produce was consumed by the gardeners' households, lettuce for example, was grown only for sale.

In drylands, seasonality affects the returns gardeners can get for their produce. For example, male market gardeners in northern Nigeria have timed production of their garden crops, such as onions, to take advantage of the seasonal changes in market prices. Onions are grown in the dry season and sell for the highest price during the rainy season; however, the gardeners need some income before that peak period. To meet their needs some gardeners plant an early crop to sell locally and then plant again, later, to sell in the profitable rainy season. Others plant only one crop of onions which are stored for sale during the rainy season. These gardeners sell guavas, limes, and mangos to give them income before the rainy season.

Gardens can also save money by producing items that would otherwise be purchased. In the slums of Lima, Peru, the average savings over a five-month growing season for a sample of 40 gardens was approximately 4 percent of annual earnings. Low income was the primary reason given for cultivation of gardens for home consumption in a sample of 50 homeowners in Lusaka, Zambia, where 57 percent of all households in low-cost housing areas have gardens. Whether in the form of savings or income, the use of additional household resources from gardens depends on patterns of control within the household, and on external factors influencing markets and consumers in the area.

Women. Women are often responsible for providing weaning foods, condiments, relishes, and sauces, and can grow many of the ingredients for these in their gardens. Household gardens, along with other home-based activities, can provide women with a means of earning income while adhering to cultural or religious requirements for female seclusion. Gardens may also be important because they are production systems that do not require large investments of time, land, and other resources which women frequently do not have.

In one project in Botswana 29 of 33 household gardens adjacent to a dam belonged to women from the poorest segment of the community, and 21 of the 33 gardeners cited the gardens as their sole or major source of cash income. Among the female members (33 of 78) of a fruit and vegetable growing cooperative in Zambia, 44 percent felt that their garden incomes had made them less dependent on their husbands.

What eventually occurred at both of these projects is an example of a problem that women's market gardens may encounter. That is, if the gardens

become economically successful, men may use their superior social positions to usurp women's control. This is a serious problem because as biases in agricultural development have tended to exclude women from the control over resources that they once enjoyed, gardens may be one of their last sources of independent income.

Conclusions

(Back to top)

The success of household gardens as a dryland development strategy depends upon their ability to address development goals. There is evidence that household gardens have the potential to improve the nutritional and economic well-being of dryland households, but if and how this potential is realized will be shaped by our attitudes toward development. Like any other development strategy, household gardens can take different forms and serve different goals because their promotion involves judgments based on human values.

We believe that traditional gardens are the best foundation for supporting garden development projects that emphasize equity, participation, and sustainability. Traditional gardens offer a wealth of insights into motivations, skills, resources, and limitations affecting gardening.

Garden projects based on external models, be they models of Western, industrial-style gardens or a style traditional in another area, obscure these valuable insights and run the risk of being unrealistic for local circumstances. Unfortunately, this is a common occurrence in garden projects and the predictable outcome is that the end of external project support is soon followed by the demise of garden activities promoted by the project.

But basing projects on traditional gardening does not mean ignoring Western scientific knowledge. Formal Western science has much to offer dryland gardens, especially for understanding the details of basic principles regarding plants, soils, and water. Although expressed in different ways, traditional knowledge takes the same basic principles into account. Just as Western science is based on experimentation and observation, gardeners and farmers experiment, observe, and innovate to develop gardening techniques that work given their needs, constraints, and resources.

Western science can help gardeners and project workers understand how traditional gardening methods work, and therefore how they might be improved. This is especially important when circumstances change, for example, due to increased drought, decreased availability of organic matter, or when people move to a new environment. An emphasis on basic principles and respect for the skill and knowledge of local gardeners encourages finding local solutions to garden problems. Solutions found this way are most likely to represent gardeners' interests, available resources, and most important, local control.

This article is based on two other works by these authors: "Household

Gardens as a Development Strategy" (Cleveland and Soleri 1987) in Human Organization 46(3):259-270 and Food from dryland gardens (Cleveland and Soleri 1990), published by the Center for People, Food and Environment. All references used for this article can be found in those two works.

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[\(Back to top\)](#)

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[About the Arid Lands Newsletter](#)

[ALN HOME](#)

[BACK ISSUES](#)

[PRE-WEB ARCHIVES](#)

[THIS ISSUE'S CONTENTS](#)