

Peri-urban horticulture & household gardens



Peri-Urban Horticultural Systems and Household Gardens in Sub-Saharan Africa

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Background information

Sub-Saharan Africa (SSA) has diverse climatic zones, including arid, semi-arid, humid and semi-humid (Harvestchoice/IFPRI 2015). This broad range of climates allows a high diversity of plant species including many agriculturally important crops to grow in the region. Peri-urban horticultural systems are important as suppliers of vegetables to the growing urban populations.

Their proximity to major markets makes it possible to produce perishable products such as vegetables. Such proximity is especially important in lower-income countries where the lack of good roads and cold chain options make it challenging to transport vegetables over longer distances.

Household gardens (or home gardens, kitchen gardens, backyard gardens) are an integral part of local food systems all over the world and make an essential, yet often little recognized, contribution to food and nutrition security. Gardening is an ancient practice and probably the oldest form of crop cultivation. Household gardens are typically mixed cropping systems that may include seasonal vegetables, fruit trees, herbs and spices and other useful plants and may be combined with livestock. Gardens are usually located close to dwellings for easy care and convenience and their main purpose is to supply the household with food, although excess production may be sold or shared.

The role of peri-urban horticultural systems is the provision of food whereas the role of household gardens includes cultural and regulatory services alongside food production. Cultural services include the conservation of plant species diversity and indigenous knowledge of plants, making living spaces more liveable and more beautiful (e.g. providing shade, reducing dust), a practice over which mostly women have control and the supply of inputs to the local food culture (Galhena et al 2013). Regulatory services include the recycling of organic household waste and grey water, and are mainly considered here according to water quality.



*Women harvesting amaranth, near Dar es Salaam, Tanzania
(photo: P Schreinemachers, World Vegetable Center)*

PlantSystems considered in this report

Under the peri-urban farming systems, several types of indigenous and commercial vegetables crops are cultivated to supply urban and peri-urban populations in the SSA. Vegetables, particularly tomato, okra, African eggplant, amaranth and African nightshade are among the main fruit and leafy vegetables cultivated in peri-urban areas throughout SSA (Mnzava et al 1999). These vegetables are also common in home gardens, although these generally also include many other vegetables alongside fruit trees, herbs, medicinal plants and other utility plants (Watson and Eyzaguirre 2002).







Tomato is among the main cash crops produced in peri-urban areas, but is affected by a large number of pests and diseases. African eggplant (edible fruits and greens) and okra (fruits) are also common in SSA. African nightshade and amaranth are traditional leafy vegetables that make an important contribution to nutrition security and livelihood of small-scale farmers. In general, these five vegetables are important components of the diets of most people in the region as well as sources of income and employment (provisioning) for people in peri-urban areas and improves soil health (physical, chemical and biological properties) in combination with other crops as they add soil organic matter and reduce erosion.



A man harvesting vegetables, Dar es Salaam, Tanzania (photo: P Schreinemachers, World Vegetable Center)

Vegetables health in Sub-Saharan Africa



Keystone species	Family	Health
Tomato	Solanaceae	
African eggplant	Solanaceae	
African nightshade	Solanaceae	
Amaranth	Amaranthaceae	
Okra	Malvaceae	
All species combined		

State of vegetables health in the past 30 years

Vegetable production practices in peri-urban areas of SSA are much more intensive than in field crops. Important plant health challenges have been observed over the last three decades, which vary with the vegetable type and season. For instance, smallholder tomato producers in peri-urban areas can suffer heavy losses when not investing in quality seed and good management practices.

The most important diseases in tomato production include tomato (yellow) leaf curl viruses and other Begomoviruses, bacterial wilt, Fusarium and Verticillium wilt. These diseases also affect other Solanaceous vegetables including African eggplant (Seck 2009) and African nightshade. Okra is less susceptible to diseases as compared to other vegetables. Some of the diseases of okra include vascular wilt caused by *Fusarium oxysporum*, damping-off,

Cercospora blight, powdery mildew, bacterial wilt, okra leaf curl disease, Choaneophora fruit rot and root-knot nematodes (Ariyo and Olatasan 2009).



A tomato plant infected by (yellow) leaf curl viruses (photo: Wubetu Bihon Legesse)

Leafy vegetables (amaranth, African nightshade and leafy type African eggplant) are relatively resistant to pathogens and pests. However, amaranth is affected by seedling damping off (*Pythium aphanidermatum*), stem decay caused by *Fusarium* sp., leaf and stem rot (*Choaneora cucurbitarum*) and necrotic lesions caused by *Alternaria* spp. (Blodgett et al 1998; Mnzava et al 1999). Bacterial wilt has been reported recently on amaranth (Sikirou et al 2019), and unidentified amaranth leaf blight diseases have been observed in Tanzania. Plant health challenges are much less important in home garden cultivation systems as it is a long-established tradition for SSA farmer's (Watson and Eyzaguirre 2002). In summary, the health of plants varies depending on crop type (poor in tomato, fair in African eggplant, and good in other vegetables). The overall assessment would therefore be "fair".

Evolution of vegetables health over the recent 10 years

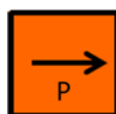
Several vegetable diseases caused by viruses, fungi, bacteria or nematodes cause high yield losses under peri-urban cultivation systems in SSA, even under high pesticide use. The frequency and occurrence of these diseases vary depending on the host, pathogen type, disease management strategies, climate, and location.

The frequency of major viruses such as Potato Virus Y and Potato Leaf Roll Virus is stable over time while frequency and damage by TYLCV has increased over the past years. Plant virus epidemics are likely to be greatly influenced by climate change, such as increased temperatures, leading to the increased abundance and activity of vectors (Jones 2009). Similarly, the frequency of occurrence, diversity and damage by bacterial wilt caused by *Ralstonia* sp. on tomato, African eggplant and African nightshade has increased and has become a challenge for smallholder farmers. The diversity of pathogen strains of viruses, bacteria and fungi has increased in recent years. Parasitic root-knot nematode is a common challenge in the sandy coastal regions and peri-urban areas where intensive farming is practiced (Coyne et al 2018). Leaf and fruit rot of amaranth and okra, caused by *Choaneophora cucurbitarum*, was a major problem during the 1980s and 90s (Teri and Malsani 1994) but has not been a major issue in recent years, except for sporadic occurrences. Other diseases such as stem decay of amaranth caused by *Fusarium* spp. (Blodgett et al 1998), damping off, leaf blight, mildew, fruit rot of okra, root-knot nematode, etc. are relatively stable except for an unidentified amaranth leaf disease which has been recently observed in Tanzania. On a 3-point scale, the state of plant health for the last 10 years has declined.



Amaranth stem canker caused by *Fusarium oxysporum* (photo: Wubetu Bihon Legesse)

Ecosystem services, as affected by plant disease



Keystone species	Family	Eco-S
Tomato	Solanaceae	
African eggplant	Solanaceae	
African nightshade	Solanaceae	
Amaranth	Amaranthaceae	
Okra	Malvaceae	
All species combined		

Level of ecosystem services generated by vegetables, as affected by plant disease, in the past 30 years

Vegetables are rich sources of vitamins, minerals, fibres and other bioactive compounds, which are critical to combat malnutrition. Vegetables also provide income, employment opportunities, and aesthetic value in the urban, peri-urban and home garden systems. Vegetables also improve the soil fauna in combination with other crops through different cultivation systems (rotation, mixed cropping, shifting cultivation). Consequently, peri-urban vegetable production strongly expanded over the last 30 years in SSA.

However, farmers growing exotic vegetables (e.g., tomato) in the peri-urban areas frequently apply toxic and sometimes banned pesticides, often in excessive quantities (Levasseur et al 2007), while yield and quality remain very low.

Consumption of vegetables in SSA is far below the minimum intake guidelines set by the WHO (~240g/day/person) due to consumers' culture and poor yield and quality of produce (Kalmpourtzidou et al 2020; WHO/FAO 2003). The poor yield and quality of vegetables is due to losses from pests and diseases, lack of knowledge on disease management and lack of good farming practices. Peri-urban tomato production is strongly hindered by plant diseases. From the standpoint of (food) provisioning, the service rendered is therefore poor.

Evolution of the level of ecosystem services generated by vegetables, as affected by plant disease, over the recent 10 years

The scale of peri-urban vegetable production has expanded in response to rising urban demand as a result of rapid urbanisation. Farmers in SSA have seen a number of initiatives over the years to improve peri-urban vegetables production and productivity. Awareness of pest and disease (diagnosis), of disease management strategies and of cultivation practices are still low but are improved compared to 10 years ago. Research and development services are playing a role in enhancing awareness of growers of input suppliers and of policy makers on pest and disease management; they also contribute to improving safe and sustainable production of vegetables. However, according to FAOSTAT (2018), vegetable yields have stagnated at low levels for the last eight years while the total production of vegetables has significantly increased. This suggests that area expansion is the main source of such increased production.

Therefore, using a 3-point scale, the trend of the effect of plant health on the generation of provisioning services remained constant. With respect to the regulating and culture services, the

effect of plant health has declined for tomato, while remaining stable for the other vegetables over the last ten years.

Complementary information

Published resources to understand the trend of plant health in SSA on peri-urban and especially for home garden vegetable production is very scarce. Observations therefore heavily rely on personal expert opinions and extrapolating from related literature on plant health reports in the region.

Despite the importance of vegetables in SSA, yields remain low at about 7 t/ha compared to 14 t/ha in Europe (FAOSTAT 2018). This is partly due to poor plant health resulting from biotic and abiotic constraints. Several new species and strains of viruses, bacteria, and fungal plant pathogens are being reported in several countries in SSA on different hosts. Climate change, globalization and increased urbanization have an effect in the introduction, evolution and spread of novel plant diseases. The introduction of new host plants also has increased the diversity of strains of many pathogens. Although farmers are becoming more aware of plant health and despite the intensive use pesticides, pest and disease problems of vegetables remain a major challenge in these systems.

Our confidence in this report is limited, because of gaps in studies that specifically address peri-urban and home garden farming systems.

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